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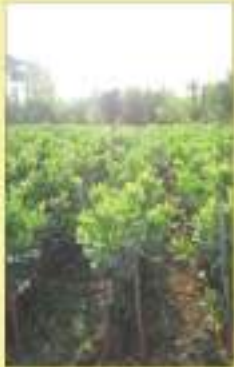


**Directorate of Arecanut and Spices Development**  
Department of Agriculture, Co-operation & Farmers Welfare  
Ministry of Agriculture & Farmers Welfare, Government of India  
Calicut - 673005, Kerala, India



# Use Quality Planting Materials from Accredited Cashew/Cocoa nurseries

## Quality standards-Cashew Grafts



Characters	Standards
Age of the graft	6 months
Number of leaves	5-7 functional leaves
Height of the graft	30-45 cm
Height of the graft Joint	15 -20 cm from collar region.
Growth	Healthy and vertical growing
Graft joint	Perfect without any girdling or constriction.
Nature of Polythene bag	Intact and not torn
Side sprout	Free from side sprout from the root stock

## Quality standards - Cocoa hybrid seedlings

Characters	Standards
Age of the seedling	5-6 months
Number of leaves	5-6 pairs
Height of the graft	45-50 cm
Growth	Vigorous seedlings growing straight at the middle of the poly-bag.
Jorquetting	No jorquetting



**Directorate of Cashewnut and Cocoa Development (DCCD) Kochi is the national agency approved by Government of India for accreditation of cashew/cocoa nurseries.**

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**DIRECTORATE OF CASHEWNUT AND COCOA DEVELOPMENT**

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# **ARTICLES INVITED FOR INDIAN JOURNAL OF ARECANUT, SPICES AND MEDICINAL PLANTS**

Indian Journal of Arecanut, Spices and Medicinal Plants is a quarterly publications in English released by the Directorate of Arecanut & Spices Development, Calicut, Ministry of Agriculture and Farmers Welfare, Government of India, dealing with the development of Arecanut, Spices, Medicinal & Aromatic Plants in the Country. It has wide circulation among farmers, Extension Workers, Scientists, Exporters, Industrialists etc.

The Journal contains popular articles on scientific cultivation, processing and marketing aspects of the above crops. Quarterly Market Reviews, Price Statistics, Forecast on Farm Operations etc. are also featured.

## **Instructions to contributors of Articles in the Journal**

1. Articles may be sent in MS Word format in CD alongwith two sets of hard copy, which should not exceed 12 pages. All pages (including tables, legends and references) should be numbered consecutively.
2. The matter is to be arranged in the following order:
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  - Conclusion
  - Tables, Illustration, Photographs etc. should be cited in the text appropriately. Line drawings must be in black colour. Photograph in colour or black & white with title indicated clearly in JPEG (High resolution) format.
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Articles will be acknowledged immediately on receipt and acceptance or otherwise will be communicated within a quarter.

**Articles selected for publication will be given honorarium**

## THE SCIENCE BEHIND FLAVOR OF SPICES

Ann Jasmine Jose, R.Sivaranjani and N.K.Leela\*

Spices are added to food in various forms - such as whole, ground or as extracts -agreeably for imparting flavor and taste to the finished product. The flavor profile of spices is attributed to a class of compounds known as essential oils, which is the volatile fraction of spice. During cutting, grinding and heating, the cell walls get ruptured and the essential oil is released. The flavors are also released during roasting, toasting, frying, and boiling. The aroma potential of a spice greatly depends on the lag time between harvesting, processing and the time it takes to reach the cooking pot. Thus freshly harvested and ground spice would furnish more flavors to food than old spices.

Spices are conventionally classified as hot spices (chilli, black pepper, ginger), mild spices (coriander), aromatic spices (allspice, cardamom, cassia, cinnamon, clove, cumin, dill, fennel, fenugreek, mace, nutmeg), herbs (basil, bay leaves, dill leaves, marjoram, tarragon, thyme) and aromatic vegetables (onion, garlic, shallot, celery)

### Essential oil (EO)

Essential oils are aromatic concentrated hydrophobic volatile liquid extracted from leaves, flowers, stalks, roots, resin and barks of plants by steam distillation or hydrodistillation process. EOs have exceptional ability to enter human body through the skin, olfactory senses, ingestion and interact with various human body

systems helping it enhance the innate ability to achieve physical and mental well-being. The EO market was worth USD 5.49 billion in 2014 and is expected to reach approx. USD 12.56 billion by 2023 while registering itself at a CAGR of 9.63 % during this forecast period.

Chemically, essential oils are composed of hydrocarbons known as terpenoids. It represents a large class of natural products with numerous biological properties and contribute to the aromatic freshness of a spice (e.g.,  $\alpha$ -terpinene,  $\alpha$ -pinene, camphene, limonene, phellandrene, myrcene, and sabinene). They are termed to be floral, earthy, piney, sweet, or spicy. The name terpenoids is derived from turpentine, the aromatic resin like exudations obtained from various coniferous trees. Terpenoids are classified as hemiterpenes, monoterpenes, sesquiterpenes, diterpenes and triterpenes, etc. based on the number of basic isoprene units it contained. Mono- and sesquiterpenes are common flavor constituents of most of the essential oil from spices along with some low-order phenolic compounds like eugenol. Monoterpenes are the most volatile of these terpenes and constitute the majority of the volatiles in spices, which give out strong aromas. Sesquiterpenes are present in cinnamon, ginger and other members of Lauraceae and Zingiberaceae family. The oxygenated derivatives, which include alcohols, esters, acids, aldehydes, and ketones, also contribute to the

\* ICAR- Indian Institute of Spices Research, Marikunnu P.O., Kozhikode - 673012.

aromatic sensations of a spice (e.g., linalool, citronellol, geraniol, carveol, menthol, borneol, fenchone, tumerone, and nerol). The compounds with benzene structure such as alcohols, acids, phenols, esters, and lactones provide sweet, creamy, and floral notes. Diterpenes and triterpenes are strong and bitter compounds. Yield of essential oil varies between different spice crops as listed in Table 1.

**Important flavor compounds in spices**

The essential oil is a mixture of several phytochemicals and the total flavor of the spice depends on the quantity of essential oil as well as ratio of aromatic compounds present in it. Spice along with important compounds present in it is listed below. (Table 2)


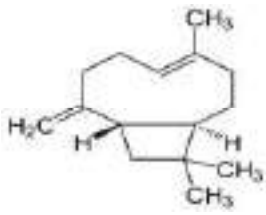

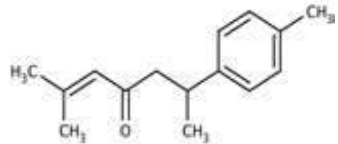

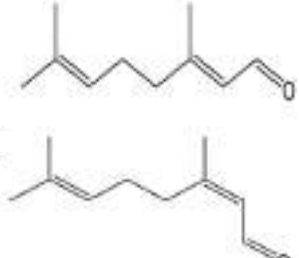
**Table1.Yield of essential oil from spices**


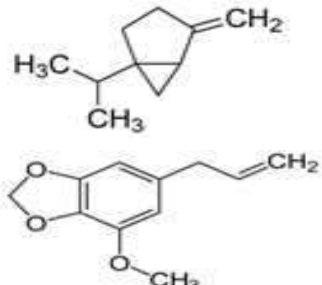

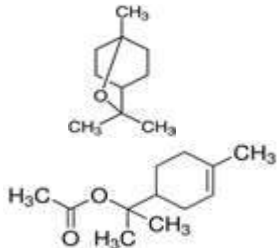

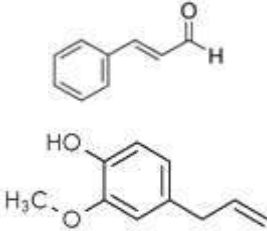

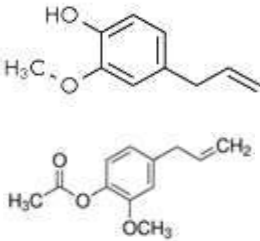

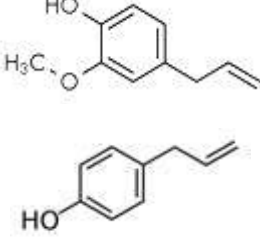

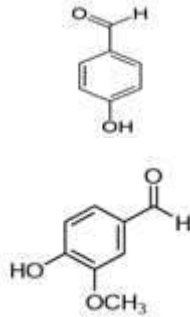
S.No.	Spice	Essential oil (%)
1	Allspice	3.0-5.5
2	Black pepper	1.0-4.0
3	Cardamom (small)	6.0-10.0
4	Clove	10.0-20.0
5	Cinnamon	1.0-3.0
6	Ginger	1.0-3.0
7	Nutmeg	7.0-16.0
8	Turmeric	2.0-6.0

**Flavor notes**

Flavor notes are descriptors of scents that can be sensed after exposure to the spice. In

**Table 2. Important flavor compounds in spices**

Spice	Major compounds	Chemical Structure
 <p>Black pepper</p>	$\beta$ -Caryophyllene	
 <p>Turmeric</p>	ar- Turmeric	
 <p>Ginger</p>	Geranial Neral	

 <p>Nutmeg</p>	<p>Sabinene</p> <p>Myristicin</p>	
 <p>Cardamom</p>	<p>1,8 Cineole</p> <p><math>\alpha</math>-Terpinyl acetate</p>	
 <p>Cinnamon</p>	<p>t-Cinnamaldehyde</p> <p>Eugenol</p>	
 <p>Clove</p>	<p>Eugenol</p> <p>Eugenyl acetate</p>	
 <p>Allspice</p>	<p>Eugenol</p> <p>Chavicol</p>	
 <p>Vanilla</p>	<p>4-Hydroxybenzaldehyde</p> <p>Vanillin</p>	

spices; these sensory descriptors are categorized as cooling, earthy, floral, fruity, herbaceous, hot, nutty, piney, pungent, spicy, sulfury and woody. Interestingly, spices possess more than one flavor profile. The following flavor notes describe the common spices used in the Indian cuisine.

Earthy - cloves, cumin, coriander

Bitter - clove, turmeric, mace

Cooling- fennel

Floral- coriander

Hot- chilli, black pepper, ginger

Nutty- coriander

Pungent- black pepper, ginger, allspice, chilli

Spicy- clove, coriander, ginger, nutmeg

Sweet- cassia, clove, nutmeg, cardamom, allspice, cinnamon

Woody- cardamom, clove

### Spices essential oil used in fragrance industry

In perfume industries, fragrance is characterized by different fragrance notes. Top notes are the scents we detect first after spraying a perfume. Low molecular weight and highly volatile compounds dominate the top note. In spices, black pepper, basil and anise have top note volatiles.

Medium to low volatility compounds dominate the middle note fragrance. Their function is to retain some of the top notes' aroma while also introducing new scents to deepen the experience. Spices like black pepper, cardamom, cinnamon have middle note constituents.

Next category is base note which is comprised of high molecular weight essential oil constituents. Along with middle notes, it

forms the foundation of the fragrance. They help to boost the lighter notes while adding more depth and resonance. Spices like clove, ginger and vanilla have constituents having base notes fragrance.

### Specific spices and their flavor

**Allspice (*Pimenta dioica*):** The allspice plant is native to Caribbean and the US. Allspice has a pleasantly warm, fragrant aroma similar to clove; but more pungent and deeply flavored. As the name suggests, it contains a blend of phytochemicals from major spices such as clove, cinnamon, nutmeg and black pepper and produces a pungent taste. The dark, hard, reddish brown berries are used in spice powders. It contains up to 5.5% essential oil and the major constituent is eugenol (80%) with nearly 30 other chemical components. The leaf is also used for flavor.

**Black pepper (*Piper nigrum*):** The dried berries of green pepper is called the black pepper; popularly known as the 'king of spice'; and possess a fine fruity, pungent fragrance with warm, woody and lemony notes. Green pepper has light aroma, with fresh pungency; it is not overpoweringly hot. The taste of black pepper is hot and biting with a clean, penetrating aftertaste arises from the non-volatile alkaloid, piperine. White pepper, which is an analogue of black pepper, is less aromatic and can smell musty, but it has a sharp pungency with a sweetish after note. Fresh black pepper oil is rich in monoterpenes (80%) such as sabinene, pinenes, limonene and 1,8-cineole. However during storage, highly volatile monoterpenes are lost and the concentration of sesquiterpenes such as  $\beta$ -caryophyllene and humulene increases.  $\beta$ -caryophyllene is the dominating compound in



**Table 3. Flavor characteristics of important volatile compounds in spices**

Spices	Compound	Aroma Descriptor
Allspice (pungent, spicy)	Eugenol $\beta$ -Caryophyllene 1,8-Cineole, Methyl eugenol	Spicy, woody, sweet Woody, spicy and terpene notes Minty, camphoraceous, cool note Musty tea like, mildly spicy, warm, slightly earthy
Black Pepper (pungent, hot)	$\beta$ -Caryophyllene Limonene  $\beta$ -Pinene	Woody, spicy and terpene notes Fresh, citrus-like, mild lemon and orange notes Dry-woody, pine-like, resinous-terpene like, spicy
Cardamom (pungent, eucalyptus like)	$\alpha$ -Terpinyl acetate  1,8-Cineole $\alpha$ -Terpineol	Sweet, herbaceous, sweet, floral with lavender nuances Minty, camphoraceous, cool note Floral, sweet, liliac-like
Cinnamon (sweet, fragrant, pungent)	<i>t</i> -Cinnamaldehyde Eugenol	warm, sweet, spicy Spicy, woody, sweet
Clove (sweet, astringent, pungent)	Eugenol Eugenyl acetate	Spicy, woody, sweet Spicy, sweet, woody, floral
Ginger (pungent, fiery)	Zingiberene $\alpha$ -Farnesene $\beta$ -Sesquiphellandrene	Spicy, fresh, sharp Mild, warm, sweet Sweet, fruity, herbal
Nutmeg (nutty, warm, sharp, sweet)	Myristicin Sabinene  Safrole, Elemicin $\alpha$ -pinene	Warm, spicy, balsamic, woody Warm, oil-peppery, piny, woody-herbaceous, spicy floral, rosy sweet Pine-like, sharp, woody, turpentine-like
Turmeric (warm, acid, bitter)	Turmerone, <i>ar</i> -Turmerone	Earthy, musky, woody
Vanillia (Sweet)	Vanillin 4-Hydroxybenzaldehyde	Sweet, creamy, spicy Sweet, nutty, balsamic, woody

berry oil, followed by  $\beta$ -pinene, limonene,  $\beta$ -pinene and humulene. It is to be noted that green pepper oil contains more oxygenated compounds than dry pepper oil.

**Cardamom (*Elettaria cardamomum*):** Cardamom is one of the most expensive spices and is known as the queen of spices. It is pungent and smoky, with a warm, bittersweet

note, yet is also clean and fresh. The green cardamom or the small cardamom cultivated in south India is superior to quality than the large cardamom or the black cardamom. The green pods have a spicy floral flavor with lemony scent. Cardamom yields up to 10% essential oil in which,  $\alpha$ -terpinyl acetate, 1-8-cineole together constitute up to 70% along with

other minor constituents. This gives cardamom a strong but mellow, fruity, and penetrating aroma. The taste is lemony and flowery, with a note of camphor or eucalyptus due to cineol present in the essential oil. The enchanting flavor of cardamom is well utilized in aromatherapy. It is used to alleviate nausea, vomiting, morning sickness and bad breath.

**Cinnamon (*Cinnamomum zeylanicum*):** True cinnamon is the light brown bark obtained from the tree *Cinnamomum zeylanicum* and is one of the oldest spices known. True cinnamon has a warm, sweet, woody, citrus like delicate flavor; where as its variant cassia has a sweet, spicy, pungent aroma with bitter taste. True cinnamon produces up to 3% essential oil and the major compound is t-cinnamaldehyde (55%-75%). The presence of eugenol in the essential oil distinguishes cinnamon from cassia, giving it the note of clove and is pleasantly aromatic. It is commonly used for de-odouring/masking in the food industry. Bark and leaf oils are employed mainly in the flavoring industry as meat and fast food seasonings, in sauces and pickles, baked foods, confectionery, cola-type drinks, tobacco flavors. Iso-eugenol, derived from cinnamon leaf oil, is also a flavoring agent in confectionery and liqueurs. It also finds application in dental and pharmaceutical preparations.

**Cloves (*Syzygium aromaticum*):** Clove is the dried unopened flower buds from the tree *Syzygium aromaticum*. The aroma of cloves is burning, sweet and warm, with notes of pepper and camphor. The taste is fruity but also sharp, hot and bitter; and leaves a numbing sensation in the mouth. Clove yields up to 20% essential oil and the major compound is eugenol (70-95

%), followed by eugenyl acetate (up to 20 %) and  $\beta$ -caryophyllene (12-17 %). Eugenol in the essential oil is mainly responsible for the characteristic taste. The essential oil of clove has antibacterial and antifungal properties and is used to relieve pain and promote healing. Iso-eugenol is mainly used for cigarettes, non-alcoholic beverages, ice cream and chewing gum.

**Ginger (*Zingiber officinale*):** Ginger has a characteristic lemony, musty and earthy with slight woody flavor. Zingiberene accounts for 30% of the essential oil, and other contributors to the characteristic flavor of ginger include  $\beta$ -sesquiphellandrene and ar-curcumene. The lemony note of ginger arises from the combination of geranial, neral,  $\beta$ -sesquiphellandrene and ar-curcumene. The woody note is contributed by nerolidol. Ginger oil is used as flavourant in food processing, pharmaceuticals and also in perfumery. The pungency of fresh ginger is attributed to the presence of gingerols. However, during heating or drying, gingerols are transformed into different compounds zingerone, shogaols and paradol which alter both the flavor and pungency of the spice. Therefore dried ginger is less aromatic than fresh and the taste is fiery, pungent and penetrating.

**Nutmeg (*Myristica fragrans*):** Nutmeg and mace are two distinctively different spice products produced from the fruits of *Myristica fragrans* and have a similar rich, fresh, warm aroma. The characteristic flavor of nutmeg is described to be sweet, woody and spicy. Nutmeg produces about 16% essential oil with spicy, warm, sweet and penetrating odor. Nutmeg smells sweet but is more camphorous

and pine-like than mace. Mace yields 11-15% essential oil, very aromatic and warm, spicy, slightly fruity. Mace oil also possess fresh and warm aroma, but the smells are stronger and demonstrate a floral character with notes of pepper and clove.

The taste of both nutmeg and mace is warm and highly aromatic, but nutmeg has hints of clove and a deeper, bittersweet, woody flavor. The taste of mace is warm, aromatic, delicate, and subtle with some lemony sweetness, yet it finishes with a potent bitterness. Major constituents of the monoterpene hydrocarbons in nutmeg oil are pinene and sabinene. The warming terpenes impart a woody, bitter peppery odor to the spice. Yet major aromatic ether constituent is myristicin. Other prominent flavor compounds; safrole and elemicin together with myristicin establish the aroma and medicinal properties of nutmeg. The hallucinogenic properties of nutmeg seed is attributed to the presence of myristicin and elemicin. The essential oil of nutmeg is used as a natural flavoring extract in the pharmaceutical

and cosmetics industry.

**Turmeric (*Curcuma longa*):** Fresh turmeric has a subtle woody, earthy flavor with gingery, bitter taste. Dried turmeric has a rich, woody aroma with floral, citrus and ginger notes. The taste is slightly bitter and sour, moderately pungent, warm and musky. Turmeric yield up to 6% essential oil that is pale yellow in color and contains about 60 % turmerone and ar-turmerone. The real contribution of turmeric is its health benefits and color more than flavor. The principal compounds responsible for color is curcuminoids, which is an important phytochemical and finds great application in modern medicine.

### Conclusion

Essential oil is responsible for the distinct flavor of a spice. The quantity and the chemical composition of essential oil vary drastically from species to species and each compound adds a special flavor note to each spice. The perceived aroma of a spice is a mixture these various flavor notes.

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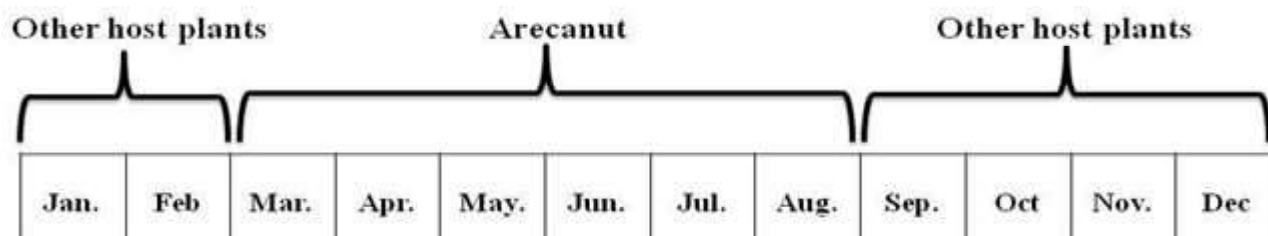
## AN EMERGING PEST IN ARECANUT : PENTATOMID BUG, *Halyomorpha picus*

S.H. Thube, E.K. Saneera, R.T.P. Pandian, M. Chaithra, N.R. Nagaraja, U.K.Priya and  
Bhavishya\*

'Arecanut' or 'betel nut' (*Areca catechu* L.) is one of the important commercial plantation crops attributing high economic return in terms of export. India is the largest producer and consumer of arecanut in the world. It is growing in parts of Karnataka, Kerala, Assam, Meghalaya, West Bengal, Mizoram, Tamil Nadu, Tripura, Maharashtra, Goa, Andhra Pradesh, and Andaman and Nicobar Islands. It is known for multifaceted uses *viz.* chewing, important component of the religious, social and cultural celebrations in India. Also it is used in ayurvedic and veterinary medicines (Bavappa *et al.*, 1982).

The palm is prone to attack by a large group of insects (Saneera and Thube, 2016). So far, about 102 insects and non insect pests have been reported from arecanut (Nair and Daniel, 1982). In the recent past, premature falling of nuts in arecanut gardens is increased unusually and became a serious problem in arecanut. Shedding of immature nuts in arecanut is reported due to various reasons like, nutrients

deficiencies, fruit rot disease infection, pentatomid bug infestation, environmental factors etc. Since, last few years scientists of ICAR-Central Plantation Crops Research Institute, Regional Station, Vittal has recorded remarkable increase in the pentatomid bug infestation in arecanut. Severe incidence of this pest resulted into heavy dropping of tender nuts in arecanut palm irrespective of age. This pest commence its infestation on arecanut palms from other host plants by early March and continues up to early August (Figure 1). The peak infestation is noticed during June to August months. Some of the vegetables such as, cowpea, okra, red chilli, bitter gourd, ash gourd, shoe flower plant and coccinia are reported as alternate host of pentatomid bug (Daniel, 2010). Among these hosts, cow pea is the main alternate host, which is grown by most of the farmers in the vicinity of areca garden, from which the pentatomid bug switches to the areca palm and colonize on the bunches and tender nuts.



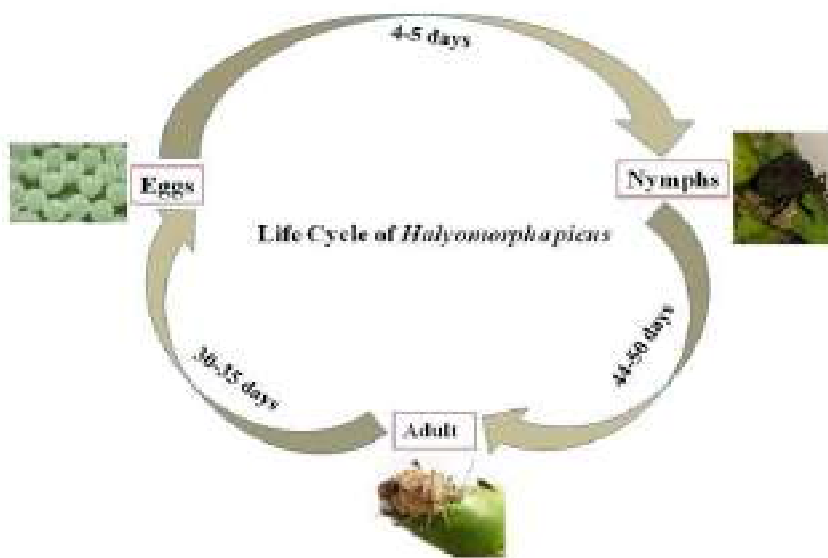
**Fig. 1. Host sequence of pentatomid bug on arecanut and other host plants**

\* ICAR-Central Plantation Crops Research Institute, Regional Station, Vittal, Karnataka-574243

Hence, life cycle, symptoms of infestation and management strategy of *Halyomorpha picus* has been discussed here for creating awareness among the arecanut growers.

**Life cycle:** Pentatomid bug consists of incomplete metamorphosis. Hence, its life cycle comprises of three stages *i.e.*, egg, nymph and adult. Life cycle with duration of each stage is represented below in pictorial form.

1. Premature nut falling during the monsoon (Usually infestation starts from May and prolongs up to post monsoon season)
2. Presence of the pin prick marks on the perianth
3. Presence of the pin prick marks on the fallen nuts
4. Dark discoloration of the internal content/ kernels



**Symptoms:**

Adults and nymphs consists of long sucking mouth part (Proboscis). Through this proboscis, insect sucks the cell sap from rachis of inflorescence and tender nuts, particularly from the portion closer to perianth. Incidence of the pentatomid bug can be identified based on the pin prick marks on the perianth and nut surface. Continuous sucking of the sap from perianth region, results in the reduction of turgor pressure that leads to premature nut falling in arecanut. Specific damaging symptoms of the pentatomid bug in arecanut are mentioned below;

**Management:**

Monitoring is considered as the backbone of any Integrated Pest Management (IPM) programme. Keeping in view of the deleterious effect of the chemical pesticides on environment, insecticide should be the last resort in any IPM programme. Pentatomid bug can be managed successfully by using following strategies;

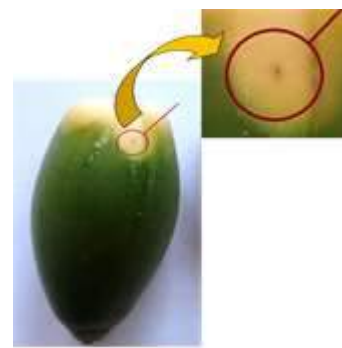
1. Adoption of clean cultivation practices like collection and destruction of the various stages of this insect seen on alternate hosts *viz.*, cowpea, bhendi, bitter gourd, chillies etc, before adults shift to areca palms.



**Tender nut dropping**



**Pin prick mark on perianth**



**Pin prick mark on tender nut**



**Feeding mark reached inside nut**



**Discoloration of kernel**



**Nymph (Black) and adult (Brown) of *H. picus***

**Fig.2. Various symptoms of *H. picus* infestation in arecanut**

2. Once occurrence of the pest confirms with lower population build up, neem oil 2.5 % can be sprayed to the infested and surrounded palms.
3. If population and nut fall is more, spraying of Clothianidin 50WDG @ 0.3 g/litre of water or Thiamethoxam 25 WG @ 0.4g/litre of water can be done to the infested and surrounded palms. The spray fluid should thoroughly cover the inflorescence and developing nuts, as these are the main site of breeding for this pest.

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## *Curcuma* AS A NATURAL SOURCE OF STARCH

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Starch is the most widely available carbohydrate and a major component of various rhizomatous perennial tubers/herbs. It is one of the major components of human nutrition and provides about 70-80% of the calories consumed by humans worldwide. Since, most of the conventional sources are being overexploited, exploring the new botanical sources of starch are required to ease the pressure on the traditional sources. Starch is not only known for its nutritional value, but also for its industrial applications. Starch is composed mainly of two polymers - amylose and amylopectin. The proportion of these two polymers in native starch varies from 20 to 30% for amylose and from 70 to 80% of amylopectin. There are many starch rich tuber crops like potato, tapioca and sweet potato. Apart from the common starch rich crops, there are some underutilized starch rich rhizomatic crops with medicinal and nutritive values; they are popularly called as arrow roots. Major types of arrow root used in India are discussed here.

**The common arrow root (*Maranta arundinacea* L.):** It is the most widely cultivated source of arrow root; a nutritive medicinal herb also known as West Indian arrow root belongs to the family Marantaceae, known as "Bilathi Koova" in Malayalam. It is native to Mexico, Central and South America. *Maranta* is an herbaceous perennial and hardy plant which yields highest amount of starch among the

rhizomatous arrow roots cultivated in India.



*Maranta arundinacea*

Edible part of the plant is the underground rhizome. The rhizome contains 23% edible starch called arrowroot powder (koovapodi). Aside from being high in protein and several nutrients, arrowroot is very easy to digest, making it ideal for children and elder persons who need gentler food. Arrowroot is boiled and eaten as a nutritive food and as a medicine. Internally, the powder is found to be beneficial in urinary problems, menorrhoea and digestive troubles. Arrowroot powder is given as antidote in case of food poisoning and toxic effect of some herbs; the powder is also used externally on wounds. The rhizomes contain fiber, fat, albumen, sugar and gum apart from starch. Plant rarely produces seeds and reproduction is normally by planting rhizome bits with a bud. Rhizomes are harvested when the aerial part of the plant dries after 10-12 months of growth. The rhizomes are thick, fleshy, creeping, spindle-shaped, long and dull white to creamy coloured and contain fine easily digestible starch. It is

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cultivated throughout the West Indies, Southeast Asia, Australia, and South Africa. In India, arrowroot is mainly cultivated in Uttar Pradesh, Bihar, Orissa, West Bengal, Assam and Kerala. Its powder is one of the nature's finest carbohydrates.

Apart from *Maranta*, some of the *Curcuma* species belongs to the family Zingiberaceae is also used to extract edible starch in various locations in India. *Curcuma* species has been traditionally used as a medicinal crop. The genus *Curcuma* occurs in the tropics of Asia and extends to southern China, Sri Lanka, Indonesia, Philippines, Africa, and Australia. *Curcuma* is reported to be used as a source of an easily digested starch, which is rather similar to that of arrowroot. In India, it is utilized on a cottage industry basis for the preparation of baby foods. Even though the starch yield is lesser and extraction process is difficult compared to *Maranta* species, the starch of *Curcuma* is highly sought offering higher price owing to its unique taste and medicinal value. These species are generally gathered from wild by local people. Due to the shortage in supply and increased demand, some of the entrepreneurs have now taken up commercial cultivation and marketing of arrow root powder from different *Curcuma* species. Current price of *Curcuma* arrow root powder is Rs 1000/- per kg or above.

Major *Curcuma* species used for extraction of arrow root in India are 1. White arrow root or 'Vella Koova' (*Curcuma angustifolia*, *C. haritha*) 2. Yellow arrow root or 'Manja koova' (*C. xanthorrhiza*) and 3. Blue arrow root or 'Neela Koova' (*C. aeruginosa*). Apart from these some other species such as *Curcuma leucorrhiza*, *Curcuma caulina*, *Curcuma pseudomontana*, and

*Curcuma rubescens*, are also used as sources of arrowroot powder and in local and tribal medicines. Since most of the species are known by different local names in different localities, there is often confusion in the species identity. Common species of *Curcuma* used for extraction of arrow root powder are discussed here

#### ***Curcuma angustifolia* Roxb.**

*Curcuma angustifolia* is commonly called as East Indian arrow root and Tikhur in Hindi; the rhizomes are rich in starch which is used as food and as a medicine. East Indian Arrowroot is recognized as a medical herb.



*Curcuma angustifolia*

It is nutritive and well suited for infants instead of breast milk or for a short time after having weaned them. The starch has cooling effect on the body, gives relief in irritation and inflammation and it is given to heal peptic ulcers and dysentery. It is also used as tonic and nutritious food in case of weakness, chronic diseases, jaundice and excessive thirst. The plant is a perennial rhizomatous herb endemic to India distributed in North Western and Central Himalayas, Bihar, West Bengal and South India at higher elevations. It produces a small spiked inflorescence with three or four yellow, funnel-shaped flowers within tufts of pink coma bracts. Inflorescences are usually produced at the



beginning of the monsoon even before the emergence of leaves have and it may continue to flower even after the leaves have fully developed. Leaves are simple, green, glabrous, and lanceolate, with entire margins. They display fine parallel venation from the central midrib. The leaves smell and taste like turmeric. It is propagated from rhizomes and harvested when the leaves show wilting after 8-10 months of growth. The rhizome is processed to obtain the edible starch which has properties similar to arrowroot and corn starch. In India, this is mainly cultivated in Bihar, West Bengal, Maharashtra, Kerala, Tamil Nadu, Karnataka and Andhra Pradesh.

***Curcuma xanthorrhiza* Rosc.**

*Curcuma xanthorrhiza* is commonly used in medicine and it is rich in edible starch. It is native to Southeast Asia. This species occurs mainly in the North Eastern and West coastal regions of India, extending to the hills. It has also been



*Curcuma xanthorrhiza*



*Curcuma aeruginosa*

under cultivation in earlier times for extracting arrowroot powder. The plant is an annual or biennial, aromatic, rhizomatous, tall herb. Rhizomes are large with yellow colour inside like turmeric. It is used in traditional and local medicines as a, cardio-tonic, carminative, diuretic, and anti-spasmodic.

This was reported to have cosmetic properties. The species is semi-domesticated and is found in the forests of eastern Himalayas, Bengal, and Kerala. It is cultivated in Kerala, Karnataka, Tamil Nadu. This species is often misidentified and sold as 'Kasturi Manjal' in place of *Curcuma aromatica* in some places.

***Curcuma aeruginosa***

*Curcuma aeruginosa* is known as 'neela koova', a nutritive medicinal herb used for extraction of starch from the underground rhizome; the plant has got numerous pendulous tubers, oblong with pearl white colour inside. Leaves are broad, lanceolate, uniformly green.



It is propagated from rhizomes and harvested when the leaves show wilting (8-10 months). It is naturally distributed through the hilly areas of Orissa, West Bengal, Jharkhand and Chhattisgarh. It is grown in Kerala and many parts of Western Ghats.

Neelakoova powder has high antioxidant and antimicrobial qualities. It is excellent for reproductive systems and enhances the semen quantity and quality. It is extremely good for dysuria and leucorrhoea. Koovapodi cools the body, reduces urinary trouble and prevents stone formation. It also has calcium, manganese, potassium, phosphorus and other minerals. Koovapodi can also be used as a weaning food as it can be easily digested by the body. The natives prepare many herbal dishes using the starch extracted from the rhizomes. In tribal belts of Chattisgarh and Orissa people prefer dishes made from rhizomes in hot summer.

It is believed that the rhizomes remove extra heat from the body and develops resistance against common diseases. It is used specially during observing fast as a part of ritual. Tubers are cleaned and scraped after harvesting and then it is washed. After that it is rubbed on a rough rock surface to produce pulp, the pulp is washed with water; the fibre is discarded and kept for sedimentation of starch. After the starch settles in the water, water is discarded, and fresh water is added. This process continuous till the residue is pure white. The extracted starch is sun dried to get the arrow root powder.

#### Method of starch extraction from *Curcuma*

Traditional starch extraction technique by garnishing of rhizomes on back side of sieve

followed by filtration using cloth and sedimentation. The improved starch extraction technique involved grinding of rhizomes in grinding machine. The improved method of starch extraction is 20 times more efficient as compare to traditional method of starch extraction from rhizomes. Multipurpose starch extraction machine was developed in ICAR-Central Tuber Crops Research Institute (CTCRI), Sreekariyam, Thiruvanthapuram, Kerala for the purpose of starch extraction from other tuber crops.

Compared to starches from other raw materials, *Curcuma* starches show a characteristic grain profile, with higher viscosity values. The viscosity profiles showed that these *Curcuma* starches have high thickening and gelling properties, and high stability when agitated. Thus, it can be a potential source of starch for food industry. The above-mentioned *Curcuma* species have been collected from different places is conserved at National Active Germplasm Site (NAGS) of ICAR Indian Institute of Spices Research, Kozhikode, Kerala.

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## BORDEAUX MIXTURE - A UNIVERSAL BLEND FOR *Phytophthora* MANAGEMENT IN ARECANUT

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### Introduction:

Bordeaux mixture is one of the important non-systemic copper fungicides used for the management of many crop diseases. The Bordeaux mixture is a combination of copper sulphate, lime and water. This was accidentally discovered in 1882 and introduced in the year 1885 by P. M. A. Millardet from University of Bordeaux, France for the management of Downy mildew of grapes. Later on it was successfully used for the management of oomycetes pathogens.

Bordeaux mixture accomplishes its effect by means of the copper in the form of cupric ions ( $\text{Cu}^{2+}$ ) of the mixture. These ions affect enzymes in the fungal spores in such a way as to prevent germination. Hence, Bordeaux mixture must be used preventively, before the fungal disease attack. 1% Bordeaux mixture is the commonly recommended fungicide for the management of coconut bud rot, basal stem rot of coconut, arecanut fruit rot (Mahali/ Koleroga), cocoa black pod rot and stem canker diseases.

### pH determination of Bordeaux mixture:

The ratio of copper sulphate to lime solution governs the pH of the prepared mixture. The mixture prepared in the above said ratio gives neutral or alkaline mixture. If the quality of the

used materials is inferior, the mixture may become acidic. If the mixture is acidic, it contains free copper which is highly phytotoxic resulting in scorching of the plants. Therefore, it is highly essential to test the presence of free copper in the mixture before applied.

There are several methods to test the neutrality of the mixture, which is indicated below:

1. **Field Test:** Dip a well-polished knife or a sickle in the mixture for few minutes. If reddish deposit appears on the knife/sickle, it indicates the acidic nature of the mixture.
2. **Litmus paper test:** The colour of blue litmus paper must not change when dipped in the mixture.
3. **pH paper test:** If the paper is dipped in the mixture, it should show neutral pH.
4. **Chemical test:** Add a few drops of the mixture into a test tube containing 5 ml of 10% potassium ferrocyanide. If red precipitate appears, it indicates the acidic nature of the mixture.

If the prepared mixture is in the acidic range, it can be brought to neutral or near alkaline condition by adding some more lime solution into the mixture. Practically, field test and pH paper test is used to determine the quality of the Bordeaux mixture.

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### 1% Bordeaux mixture preparation:

To prepare 1% Bordeaux mixture, three main constituents are required i.e. copper sulphate, lime and water. Purity of the ingredients and method of preparation decides the quality and effectiveness of the prepared

solution. Lime is available in the market as two different forms i.e. calcium hydroxide (also called as 'hydrated lime' or 'slaked lime') and calcium oxide (also called as 'quick lime' or 'burnt lime'). Detailed procedure of 1% Bordeaux mixture preparation is summarized below with illustrations (Fig.1).

**Fig. 1. Preparation of 1% Bordeaux mixture**

 <p>Copper sulphate</p> <p>Quick lime</p> <p>Hydrated lime</p>	<ul style="list-style-type: none"> <li>● Ingredients of Bordeaux mixture i.e. copper sulphate and lime (quick lime or hydrated lime)</li> </ul>
 <p>Copper sulphate solution</p>  <p>Hydrated lime solution</p>	<ul style="list-style-type: none"> <li>● Dissolve 1 kg copper sulphate crystals in 10 litres of water in a plastic container.</li> <li>● Dissolve required quantity* of quick lime or hydrated lime in 10 litres of hot water in another plastic container.</li> </ul> <p><b>* Note: If quick lime is used, ~750g-850g is needed and if hydrated lime is used, ~375g-450g is needed to neutralize the copper sulphate solution.</b></p>
 <p>Mixing of Copper sulphate and hydrated lime solution</p>	<ul style="list-style-type: none"> <li>● Pour both the copper sulphate and hydrated lime solutions simultaneously to 80 litres of water with constant stirring and check for the pH until it becomes neutral.</li> <li>● The mixture should be tested for its neutrality of the pH (pH of 7.0); because the free radicals of the copper are toxic to the plants.</li> </ul>



Checking the pH of the Bordeaux mixture



Checking of Bordeaux mixture with a knife

- To test the neutrality of the pH, either pH paper or a well-polished knife or a sickle can be used for checking.
- Dip pH paper in the solution and if it turns blue it indicates that the mixture is neutral.  
(or)
- Dip a well-polished knife or sickle into the mixture. If the blade shows a reddish colour, add lime to the mixture till the blade does not show staining on dipping the knife

- As per the weather conditions (rainy/ wet), required quantity of the wetting agents (resin or soap solution) can be added before spraying.
- Mist nozzle should be used for effective spraying.

### Preparation of 10% Bordeaux paste

Bordeaux paste consists of the same constituents as that of Bordeaux mixture, but it is in the form of paste as the quantity of water used is too little. For preparation of 10% Bordeaux paste, 100 g copper sulphate and 100 g quick or hydrated lime each are dissolved in 500 ml of water separately and mixed thoroughly until to get a paste.

### Uses of Bordeaux mixture/ Bordeaux paste:

- 1% Bordeaux mixture is recommended twice-thrice as a prophylactic spray in the

form of mist spraying.

- First spray during pre- monsoon showers and the second spray after 40-45 days of first spray in the coconut, arecanut and cocoa orchards for the *Phytophthora* disease management. If necessary, a third spraying can be given.

(Please note that first round of spraying should be given on bunches and the rest two rounds should be focused on bunches as well as crown region in case of arecanut to avoid bud/crown rot disease in arecanut)

- Bordeaux paste can be used for swabbing the cut ends of the pruned branches of cocoa plant as well as treatment of canker infected cocoa trees and also in the coconut/arecanut crown portion after removing the crown/bud rot diseased spindle leaves.
- In cocoa, spraying of Bordeaux mixture after pruning will help in reduction of the past season inoculum and protect the preceding season crops from diseases.

**Precautions:**

- ⇒ The solution should be prepared fresh always in the earthen or wooden or plastic containers.
- ⇒ Avoid using metal containers for preparation, as Bordeaux mixture is corrosive to metal vessels.
- ⇒ The prepared Bordeaux mixture should be sprayed within 4-5 h.
- ⇒ At the time of preparation and spraying proper stirring is required.
- ⇒ Don't add hot water during solution preparation.

- ⇒ Don't mix any fungicides or insecticides along with Bordeaux mixture.

**Advantages of Bordeaux mixture:**

- Very easy and can be prepared by farmers themselves.
- Can act as fungicide and bactericide.
- The chemicals required for this is copper sulphate and lime which is easily available in the market.
- It is less toxic to humans i.e. safety to handle as compare to other commercial fungicides.
- Possess a natural adhesiveness of tenacity.
- Relatively cheaper.
- Manages relatively a wide range of oomycetes pathogens, especially *Phytophthora* spp.

**Reference:**

Keerthana, U., Chaithra, M., Purandhara, C. and Santhoshkumar, P. 2016. *Preparation of Bordeaux mixture*. Extension Folder No.: 246. ICAR-Central Plantation Crops Research Institute, Kasaragod.

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## MULTIPURPOSE SPICE TREE : TAMARIND

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Tamarind (*Tamarindus indica* L.) is one of the most wide spread trees of Indian subcontinent. It is a multipurpose spice and fruit crop. The pulp has been used as a seasoning or spice or fruit, especially in the southern part of India, for a long time (Shankaracharya, 1998). The name tamarind was derived from the Arabic word "Tamar-E-Hind" meaning "Date of India". It is cultivated throughout the tropics and subtropics of the world and has become naturalized at many places. In India, it is abundantly grown in Karnataka, Madhya Pradesh, Bihar, Chattisgarh, Andhra Pradesh and Tamil Nadu (Algabal *et al.*, 2012).

India is the world's largest producer of *Tamarindus indica* L. and commercial exploitation of its products dates back to several centuries. Out of 52 spices under the preview of Spice Board, the tamarind spice is at the sixth position in terms of export from India (Sinha *et al.*, 2015). While it is the only country to exploit tamarind extensively with the annual pulp production of 3.00 lakhs tonnes of which 11,500 tonnes are exported to Europe and North America and the rest is locally consumed. The dry pulp is exported to various countries *viz.*, USA, Europe, Australia, African, Sri Lanka, Malaysia and Pakistan, *etc.* (Anon, 2009).

Tree is a short-trunked, growing up to a height of 25 m with dome shape of crown. It is a long-lived, large with a thick trunk up to 1.5

to 2 m across. Leaves are alternate and even-pinnate. Flowers are borne in lax racemes. The most useful part is the pod (also called the fruit). Pods are 7.5-20 cm long, 2.5 cm broad and 1 cm thick, which is slightly curved, brownish-ash coloured. Each pod has hard outer shell, the pulp is firm and soft which is thick, blackish brown and contains 2-10 hard dark-brown seeds. The pulp and seeds held together by extensive fiber network. The ripe pods consist of 55 per cent pulp, 34 per cent seed, 11 per cent shell and fiber (Shankaracharya, 1998).

It is a hardy and drought tolerant tree hence ideal for arid regions. Further, it performs well in deep soils and also found growing in wastelands. In view of its ability to withstand heavy winds, it is preferred as a windbreak. The tree is also widely planted in avenues. Nowadays, this fruit crop is gaining popularity among the farming community as well as processing industries due to its immense demand (El-Siddig *et al.*, 2006).

Tamarind varieties have been classified on the basis of various characters. East Indian types have long pods with 5-12 seeds and West Indian types have shorter pods with 1-5 seeds. The red colour of pulp is due to anthocyanin pigment, while in the common types of pulp is due to leuco-cyanidin (Shankaracharya, 1998). The ripe fruits of some varieties have sweet pulp coupled with less acidity and are suitable for

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dessert purpose. Sour type fruits are highly acidic in taste and are preferred pulp which is commercially marketed. Some of the promising selections made on the basis of high yield with high pulp content from different states of India (Nath *et al.*, 2008) are mentioned below:

States	Varieties
Karnataka	DTS-1, DTS-2 and Hasanur.
Tamil Nadu	PKM-1, PKM-2, PKM-3 and Urigam
Maharashtra	Pratisthan, No.263, Yogeshwari, T-9, T-10, T-11, T-12 and T-13
Rajasthan	Goma Prateek

The fruit both ripe and dry contains mainly tartaric acid, reducing sugars, pectin, tannin, fibre and cellulose. Generally, the chemical constituents of the fresh ripe tamarind varieties varied depending on location, soil, climate and other agro-climatic conditions *i.e.*, moisture content (20.15 to 24.50 %), TSS (18 to 48 OBrx), tartaric acid (15.84 to 20.16 %) and ascorbic acid (0.68 to 20 mg/100 g). The most outstanding characteristic of tamarind is its sweetish acidic taste which is predominantly due to tartaric acid (Ishola *et al.*, 1990).

### Uses of different parts of the tree

#### Medicinal uses

##### Pulp

Tamarind pulp has long been used for many medicinal purposes. Alone or in combination with lime juice, honey, milk, dates and spices is used as a digestive and carminative. It has been used in the treatment of a number of ailments, including the alleviation of sunstroke, Datura poisoning, cure of malarial

fever and the intoxicating effects of alcohol. It is said to have anti-fungal and anti-bacterial properties (El-Siddig *et al.*, 2006).

##### Seed

The seed is usually powdered and is often made into a paste for the treatment of most

external ailments. It has been reported that powdered seeds have been used to treat boils, dysentery, eye diseases, bladder stones, chronic diarrhea, jaundice and ulcers. The powdered seed husk is used to treat diabetes and also having a strong antioxidant activity (El-Siddig *et al.*, 2006).

##### Leaves

Tamarind leaves are usually ground into powder and used in lotions or infusions. The leaves, mixed with salt and water are used to treat throat infections, coughs, fever, intestinal worms, urinary troubles and liver ailments. Leaf extracts also exhibit anti-oxidant activity in the liver and used as ulcers, cardiac and blood sugar reducing medicines. Leaves paste are applied to boils to prevent suppuration and inflammatory swellings. Young leaves are reported to cure other eye infections, sprains and wounds (El-Siddig *et al.*, 2006).

##### Bark, flower and root

The bark is astringent and it is used as a

tonic, lotions or poultices to relieve sores, ulcers, boils and rashes. Ashes of the burnt shells of ripe fruits are used as an alkaline substance with other alkaline ashes in the preparation of medicine 'Abayalavana' in India, for curing enlarged spleen. Flowers are used in the treatment of eye diseases, jaundice and conjunctivitis. In India, tamarind root bark is used for prevention of pregnancies (El-Siddig *et al.*, 2006).

### **Fruit and Food Products**

#### **Pulp**

Tamarind is valued mostly for its fruit especially the pulp, which is used for a wide variety of domestic and industrial purposes. More commonly, the acidic pulp is used as a favourite ingredient in culinary preparations such as curries, chutneys, sauces, ice cream and sherbet. In Ghana, the pulp is mixed with sugar and honey to make a sweet drink, 'Jugo' and it is also used to make sweet meats mixed with sugar called 'tamarind balls'

#### **Seeds**

The seed is also used in the vegetable and food processing industries. Tamarind xyloglucan, commonly known as 'tamarind gum', is the major component of TKP. It forms a stiff gel and is used for thickening, stabilizing and gelling in food. It is commercially available as a food additive for improving the viscosity and texture of processed foods. Incorporation of TKP also affects the hardness, crispness and thickness of biscuits, Low cost TKP could be used as a substitute for costly pectin for making jellies, jams and marmalades. Seeds give amber coloured oil, free of smell and sweet to taste, which resembles linseed oil. It could be used

for making varnishes, paints and burnings in oil lamps.

### **Leaves and Flowers**

The leaves, flowers and immature pods of tamarind are also edible. The leaves and flowers are used to make curries, salads and soups in many countries. In India, leaves are made into a dish called 'Chindar'. The seedlings are also eaten as a vegetable. Young leaves of tamarind are used as a seasoning vegetable in some food recipes because of their sourness and specific aroma. Tamarind leaves are used for fodder and are relished by cattle and goats. Tamarind leaves, flowers and the fruit contains acid and are employed as auxiliaries in dye, especially with safflower. The leaves and flowers are also used as mordents in dyeing.

### **Tamarind bark and twigs**

Leaves and bark contains tannin up to 70 per cent, which has been used in the tanning industry. It is used for tanning hides and dyes. Bark tannins are used in the preparation of ink and for fixing dyes. Tamarind twigs are sometimes used as 'chewsticks' and the bark is also used as a masticatory.

### **Lac**

The tamarind tree is a host for the lac insect, that deposits a resin on the twigs. This product could be harvested and sold as stick-lac for the production of varnishes and lacquers.

### **Wood**

Tamarind wood has many uses including making furniture, wheels, mallets, rice pounders, mortars, pestles, ploughs, well construction, tent pegs, side planks for boats,

cart shafts, axles, naves of wheels, toys, oil presses, sugar presses, printing blocks, tools and tool handles and turnery etc. The heartwood of tamarind is considered to be a very durable timber and is used in furniture making as it takes on a good polish.

### **Industrial uses**

Tamarind fruits can be processed into various value added products to make it a convenient product with advantage of ease of handling, transportation, storage and use. Processing increases shelf life of fruit and apart from increasing value; it also increases income to growers and processors. The important processed products prepared from tamarind includes pickle, paste, chutney, sauce, soup, jelly, jam, syrup, candy, puree, fruit leather, alcohol and refreshing tamarind drink. Some of the major industrial product are listed and explained in detail below (Gunaseena and Hughes, 2000).

#### **Tamarind Kernel Powder (TKP)**

It is prepared by decorticating the seed and pulverizing the creamy white kernels. In India, TKP is used as a source of carbohydrate for the adhesive or binding agent in paper and textile sizing, weaving the jute products as well as textile printing. TKP can be mixed with other concentrates to make 25 per cent manufactured cattle feed. Another commercial application is, can be used in production of varnishes and act as a vegetable clarifier (Gunaseena and Hughes, 2000).

#### **Tamarind juice concentrate (TJC)**

Tamarind juice concentrate is prepared by extracting cleaned pulp with boiling water. It can be stored for long periods (Gunaseena and

Hughes, 2000).

#### **Tamarind Pulp Powder (TPP)**

Tamarind Pulp Powder (TPP) is prepared by concentrating, drying and milling the pulp into a powder form. It is one of the convenience food products produced commercially by several manufacturers in India (Gunaseena and Hughes, 2000).

#### **Tamarind pickle**

Pulp is used commercially to prepare tamarind pickle. The pickles are commonly used in Asia as an accompaniment to curries or other main meals. Tamarind pickle is available in the urban markets of India, Bangladesh and Sri Lanka and is rated as a popular product of tamarind. Pickles are hot, spicy and have a salty-sour taste and can be preserved for several months. Preservation is due to the presence of salt, increased acidity and spices. The preparation of pickles are simple and can be done at a household level (Gunaseena and Hughes, 2000).

#### **Construction**

The seed is also used as filler for adhesives in the plywood industry and a stabilizer for bricks, as a binder for sawdust briquettes and a thickener for some explosives. This material is suitable for construction such as false roofing and room partitioning (Gunaseena and Hughes, 2000).

#### **Paper making**

Tamarind seed product (xyloglucans) can be used as an alternative to currently used wet-end additives in paper making industries. Xyloglucans improves the mechanical



Tamarind tree



Flowers



Pods



Pulp



Fibres



Seeds

properties of paper sheets without affecting the optical ones (Gunasena and Hughes, 2000).

### Conclusion

Tamarind is one of the ancient and common fruit of India. It is a multipurpose spice and fruit crop. The fruit can be processed in to several value added products to enhance income of the growers and availability of varied products to the consumers. In spite of wide range of domestic, medicinal as well as industrial use, tamarind tree remains an unimproved wild tree and under exploited to meet growing commercial demand. Hence, there is a need of recognizing the superior genotypes in terms of higher yield and pulp content in order to enhance the income of the farmers.

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## POTENTIAL, UNDER EXPLOITED SPICES OF ARUNACHAL PRADESH

K. Vasanthakumar, Sanju Kumari and Megha Raghavan\*

Arunachal Pradesh, the largest state in North-East India proudly bears an account of the second largest level of genetic resources. Although the state has only a meager share of 2.5 % of India's geographic area, it has a rich possession of floral bio-diversity of which certain spices which are unique but of minor importance and not cultivated and utilized properly are characteristic of the state. Horticulture has a major share in alleviation of poverty among rural Arunachali population (Verma and Mishra, 2019). Apart from fruits, plantation crops and vegetables, major spice crops like ginger, turmeric, chillies, large cardamom, black pepper, star anise play a major role in improving the livelihood of the state's farming community. Other than the major spices, some plants having sensory characters, spicy flavors and aroma are used by the native Arunachal people as local (indigenous) minor spices in their cookery and culinary dishes. Many of these minor spices are not commercially cultivated and are collected from wild without following proper harvesting and processing methods. But the intrinsic flavor, aroma and spicy notes of these wild plants makes them unique in the kingdom of spices (Mishra, 2019).

**Hooker Chives (Local name: Phulun Zung)**  
*Allium hookeri* Thw. (Amaryllidaceae)

It is an evergreen, herbaceous, perennial

plant producing a cluster of leaves 40-60 cm long. The species is distributed in wild habitats and cultivated on a limited scale in Tawang, Lower Subansiri, West Kameng, Upper Dibang Valley, East Kameng and Papum Pare areas of Arunachal Pradesh. The plant grows from thin bulbs with thick, fleshy roots. The plant is a popular food among tribes and natives of Arunachal Pradesh, Manipur, other North-East Indian states, South-East Asian countries and parts of China. It is seldom cultivated and mostly gathered from wild sources for culinary uses. The species flourishes well in forest margins of Arunachal Pradesh mainly in moist places and meadows at elevations from 1200 - 2800 m. The plant prefers sunny positions in light, well drained soils (Ashalata *et al.*, 2014).



*Allium hookeri* plant

For edible uses as spice, the leaves are main parts used in raw form or cooked. The flowers in raw condition are also used for flavoring

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purposes and as garnish in salads. Bulbs are seldom used as spices either raw or cooked. Like other members of the onion family, leaves and bulbs contain sulfur compounds, allicin, di-allyl sulfide, phenols and phyto-sterols which give them the typical onion flavor.

When added to the daily diet on regular basis they help to reduce cholesterol levels, act as tonic to the digestive system and also activates the circulatory system.



***Allium hookeri* in flowering**

The species can be propagated by seeds which are grown in containers or in plug cells. Unlike other members of the onion family, *A. hookeri* has only very thin bulbs., edible parts of *A. hookeri* are different from other members of onion family in the sense that the flat, fleshy scale leaves borne on axils of the underground bulbs are the edible organs. Though the plants are collected from wild for spice/ medicinal uses, some cultivation has been started recently on small scale in kitchen gardens, fields and as pot-herbs. The taste and aroma of this plant has been preferred over the use of conventional onion in the preparation of recipes by tribal and native families. *A. hookeri* has been associated with the ethno-therapy of certain diseases by local healers from time immemorial and so the plant is recorded as an ethno-botanic novelty among

the traditional Arunachalis (Negi, 2006).

**Himalaya Onion (Local name: Jimbur )**  
***Allium wallichii* Kunth (Amaryllidaceae)**

This is an alpine, perennial herbaceous species which is endemic to the Eastern Himalaya- Hengduan mountains and neighbouring areas (Li *et al.*, 2010). The species has a broader geographic distribution ranging from the Himalayas westward to the east of Nanling Mountains. The species flourishes well in Arunachal on moist, grassy slopes in scrub and at forest edges or under-forest at elevations from 1800- 3400 m.



***Allium wallichii* plants**

*Allium wallichii* is a herbaceous perennial plant producing several leaves 25 - 45 cm long from an underground bulb. The cylindrical bulb divides forming a cluster of plants in a clump. The plant is usually harvested from the wild for use as food and spice. It is seldom cultivated in backyards of homes and kitchen gardens in Arunachal Pradesh, Nepal and some pockets of North-East India. Young leaves of the plant are eaten raw or cooked as vegetable and spice. The dried leaves are used as a condiment in curries and pickles. The bulbs are used as raw or cooked / boiled/ fried in ghee and eaten. The cloves are used as a substitute for garlic. Raw flowers are used as a garnish on salads.



*Allium wallichii* bulbs

Propagation is by seeds., sow during spring in a cold greenhouse. Prick out the seedlings into individual grow-bags or pots when they are large enough to handle. If a population of plants has to be produced as clumps within a short period, then three plants has to be raised in a container. Grow the container plants in a greenhouse during the winter period and plant them out in their permanent positions in spring once they are growing vigorously and are large enough.

In traditional medicine, the raw bulb is chewed to treat coughs and colds. Boiled or fried bulbs are eaten in the treatment of cholera and dysentery. It is observed that eating the bulbs can ease the symptoms of altitude sickness (De-Qing, 2014).

**Female Ginseng (Local Chinese name: DongQuai) *Angelica sinensis* (Oliv.) Diels (Apiaceae)**

It is a herb belonging to family Apiaceae and the species is indigenous to China. It grows in the cool, high altitude mountains of Arunachal Pradesh and distributed in the mountainous areas of other North East Indian states. The yellowish-brown root of the plant is harvested and is used as a spice and also well known in traditional medicine which has been in use since thousands of years (GRIN, 2012).

*Angelica* is a low-temperature and low sunshine crop, suitable for cool climate and



*Angelica sinensis* in flowering

can be cultivated at an altitude of 1500 - 2800 m. The seedling stage is shade-loving and seedlings need to be kept out of direct sunlight but mature plants are more hardy and can withstand direct sunlight. For successful cultivation, *Angelica* should be grown in loose sandy loam soil with good drainage, rich in humus and not in low-lying water stagnant soils on easily hardened and barren sandy soil.



*Angelica sinensis* roots

The roots either raw or dried are used as spice in North-East India and China for adding taste, aroma in local dishes, culinary preparations and for flavouring of beverages, cakes, candies etc. The dried roots of *Angelica* is used in traditional medicine in the belief of its benefits in women's health, cardio-vascular system, osteoarthritis, anemia and high blood pressure. The active chemical constituents present in *Angelica* roots and rhizomes are



phytosterols, furo-coumarins, polysaccharides, p-cymene, flavonoids etc. Some of these chemicals possess potent anti-oxidant activity (Wang, 2015).

**Nepal Pepper (Local name: Timroo)**  
***Zanthoxylum armatum* DC. (Rutaceae)**

It is a large, dioecious shrub with spiny branches, glossy green leaves, yellow flowers and attractive red fruits. The dried fruits, used as spice have a similar taste and flavor to Sichuan pepper (*Z. piperitum*) and are used in chutney and curries in Himalayan ranges of North East in general and Arunachali local population in particular. Timroo is a favourite flavouring agent in local cuisines of Arunachal Pradesh especially in soups/stews to keep the body warm. The fruit is rather small, produced in clusters., each fruit contains a single seed. The peel of fruits also serves as a spice.



***Zanthoxylum armatum* bearing fruits**

*Z. armatum* is widely distributed from Himalayas to eastern Asia from low elevations of 50 m to 1750 m. Ideal habitat of the species is rainforests, thickets, mountain slopes and rock ledges. Propagation of this plant is normally done by seeds and usually seeds are slow in germination and could be augmented by scarification and cold stratification. In the absence of sufficient seeds, terminal stem

cuttings may also be used as propagules (Pankaj and Usha, 2013).



***Zanthoxylum armatum* seeds**

The seed is sometimes ground into a powder and used as a condiment. The seed is a main ingredient of the famous Chinese "five spice" mixture. Timroo is used in many chronic problems such as rheumatism, skin diseases and varicose ulcers. It has a stimulating effect on the lymphatic system, circulation and mucous membranes (Chopra *et al.*, 1986).

**Indian Pepper *Zanthoxylum rhetsa* (Roxb.) DC. (Rutaceae)**

It is a deciduous tree with a spreading crown growing up to 30 meters tall. The tree has a rather long bole that can be kept up to 75 cm diameter. The tree is often grown in wild and is occasionally cultivated, especially in North-East India and Sri-Lanka and the seeds are collected and exported to China and Iran for use as a spice. Apart from its distribution in North-East India, the species has further spread to other Asiatic countries *viz.*, Sri-Lanka, Bangladesh, Myanmar, Thailand, Malaysia, Indonesia, Vietnam and Papua New Guinea.

The tree flourishes in a habitat range of rather dry, often monsoonal forests and thickets at elevations up to 500 meters. The species

prefers good, deep well-drained moisture retentive soil in full sun or semi-shade (Tropical Plants Data Base, 2020).

The seeds and bark are utilized as spice. It has a lime-pepper flavor and is added to foods as a seasoning or cooked in a syrup with other species *viz.*, cinnamon, clove, cardamom and then made into a relish. Immature fruits



*Zanthoxylum rhetsa* bearing fruits

are also utilized as a spice. The fruit wall has the taste and characteristic aroma of orange peel. Some tribal Arunachali people and native villagers use the seeds of this species as a substitute for black pepper. The ripe seeds taste at first like lemons but with a burning after-sensation. The tender leaves and fruits are also eaten raw as well as cooked. Young, tender leaves also finds wider use as a seasoning among rural people. Some villagers use the leaves like hops while brewing rice beer.



*Zanthoxylum rhetsa* seeds

The peel of the fruits, seeds, the bark of stems, roots and the essential oil extracted from fruits are used for medicinal purposes. A decoction of the bark, is taken internally as a cure for pains in the chest. The bark is pounded, mixed with oil and then used externally as a remedy for stomach pains. The fruits which are aromatic, astringent and stimulant are used in the treatment of dyspepsia, asthma, bronchitis, heart troubles, tooth ache and rheumatism. An essential oil obtained by steam distillation of leaves / fruits is used in traditional remedy for treatment of cholera.

*Zanthoxylum rhetsa* is easily seed propagated., seeds are best sown as soon as it is ripe. Stored seeds may require up to 3 months cold stratification. Germination takes place in 5 - 6 months. Prick out the seedlings into individual polybags when they are large enough to handle and grow them until large size to plant out. Stem cuttings of half-ripe wood are also used for propagation., root cuttings 3 cm long, planted horizontally in poly-bags give good percentage of success (Dirr and Heuser, 1997).

## Conclusions

Minor spices are found in wild state or grown on a limited scale in different topographies of Arunachal Pradesh *viz.*, 1.foot hills and valleys (170- 915 m) 2.mid hills ( 915 - 1803 m) 3.high hills (> 1803 m) and 4. rain shadow areas depending on the suitability of habitat of each spice crop. Currently, the spices discussed here *viz.*, *Allium hookeri*, *Allium wallichii*, *Angelica sinensis*, *Zanthoxylum armatum* and *Zanthoxylum rhetsa* are

harvested mainly from wild sources., farmers and village population are gaining awareness on these crops for wider utilization as spices and also their application for medicinal uses. Considering their importance in traditional cookery and indigenous medicines, research and development organizations need to bestow more efforts for promoting the systematic cultivation of these crops so that they will emerge to the status of "potential spices of the future" for trading in domestic as well as global markets.

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## THERAPEUTIC POTENTIAL OF INDIAN BIRTHWORT (*Aristolochia tagala* Cham.): AN ENDANGERED MEDICINAL PLANT OF WESTERN GHATS

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*Aristolochia* is a large plant genus with over 500 species belongs to the family Aristolochiaceae. It is distributed throughout the tropical and subtropical countries. The members of bitter and poisonous Aristolochias are commonly known as birthwort, pipevine or Dutchman's pipe. *Aristolochia tagala* is a rare medicinal plant of Aristolochia family which is used against snakebites and bowel complaints in the rural areas of southern India. The plant is commonly known as Oval leaf Dutchman's pipe.

### Distribution

It is a perennial twining shrub, found throughout India, Sri Lanka, China, Malaysia, Burma, Java and Australia. In India is distributed in the northeast and southern parts of India. The species is found in forests and open lowland thickets, climbing over bushes and trees. The species is mentioned as an important member of rich biodiversity of Northeast India region. Vulnerable and rare status was assigned to the species in Red Data List of South Indian medicinal plants. The plant has become rare in its natural habitat due to indiscriminate harvesting of roots for local medicine and trade.

### Composition

Roots of *A. Tagala* contains isoaristolochic acid, allantoinin, alkaloid aristolodin and

essential oil containing carboxyl compounds. Roots also contain sesquiterpene hydrocarbon, and an alcohol ishwararol (Rajasekharan *et. al.*, 1989).

### Morphology and floral biology

It is a climbing shrub. The stem is smooth, erect or somewhat twining. Leaves are entire and alternately arranged on stem. They are ovate acute or acuminate and deeply cordate with narrow sinus. The leaves are up to 8 inches long and 4.5 inches broad. There are no stipules. The flowers grow in the leaf axils. Flowers are produced in axillary cymes and are distinctly stalked. They are bisexual, zygomorphic with inferior ovary. The perianth consists of three united, tubular, 7-8 cm long, purplish-brown lobes. The inner surface of the perianth tube is lined with strigose downward-pointed hairs. The perianth tube is swollen into a globose chamber in the basal part and is purplish in colour. (Murugan *et. al.*, 2006).

They bear six dark brown, thick secretory nectars. The perianth tube terminates into a deep purplish expanded limb. Stamens, style and stigmas form a united forming a gynostemium. The gynostemium bears six stamens on the outer surface and six stigmas on the top. Anthesis starts in the afternoon (13.00-18.30 h) with the peak between 14.00

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and 15.00 h. Flowers are protogynous, stigmas start drying 24 h after Anthesis. Anthers dehisce 45-48 h after anthesis. The pollinator of *A. tagala* is a Dipterean Chironomid fly. The colour and smell of the open flower attract the flies. They enter the perianth tube and are trapped in the chamber for more than 48 h as the downward-pointed hairs on the perianth prevent their exit. The anthers dehiscence exposes the sticky and yellow pollen clumps. The frequent movement of the flies in the chamber makes Pollen grains to load onto the dorsal surface of thorax of the flies. Flies carrying pollen move out between 50 and 53 h after anthesis as the hairs on the inner surface of the corolla tube undergo senescence and shrivel up which enables insects to escape. When these flies enter another flower, it brings out the pollination. Fruit development and maturation takes about 4-5 months duration. Fruits are long talked dehiscent capsule, splitting along the placenta and with many endospermic seeds which are flattened and broad winged.

### Medicinal Uses

*Aristolochia tagala* is a traditionally important and lesser known medicinal plant. However, it is to be noted that, kanis (A tribe of Kerala) have accepted *A. tagala* as more powerful and effective when compared with *A. indica* for its medicinal value. It is traditionally used by Kanis against snake poison. In the treatment against Snake poison and scorpion poison dried Roots are used for both External application and Internal administration. Leaves medicated oil applied during night externally for the Prevention of snake bite. In Kouthalai of Tirunelveli hill, Roots are mixed with leaves

and seeds of *Aglaia roxburghiana* to treat against Snakebites, scorpion bites and insect bites (Ranjith and Ramachandran, 2010). In Mizoram, Roots are used for the treatment of bowel complaints. In Andhra Pradesh, roots are used to increase the production of breast milk and also as a carminative agent. Also, in Konkan southward-Western Ghats, Plant is a substitute of *Aristolochia indica* and functions as a carminative and promotion of menstrual bleeding i.e. acts as an emmenagogue and is also used as a carminative. (Abhijit Dey and Jitendra Nath De, 2012), Roots are used for Gastrointestinal complaints such as for dyspepsia and colic. Leaf used for rheumatism, malaria, fevers and fits. Also given for gastrointestinal complaints such as flatulence, stomach aches and flatulence. Root and Leaf has analgesic properties and can be used for rheumatic pains and toothaches. Fruit and root are used as a treatment for malaria, toothaches, rheumatism, treating snakebites and dyspepsia. In Philippines, leaf is used for treatment of cancer. (Micheal *et al.*, 2009). Women take this plant to induce menstruation. Root is used as an emmenagogue, as a carminative and a tonic and infantile tympanites, snake bites and malaria are treated with the plant. In Malay-Peninsula, leaf is used for fevers, applied to the head. For swollen limbs, abdomen and bilious disorders fornications the plant is being used. Root and bark are considered as abortive in Papua New Guinea. Pharmacologically different parts of the plant act as antimicrobial, antiproliferative, cytotoxic, analgesic, antioxidant, antifertility, insecticidal and nephrotoxic agent (Kalaiarasi, *et al.*, 2014).

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## POPULARISING ORGANIC TURMERIC CULTIVATION THROUGH WOMEN SELF HELP GROUP

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The green revolution during the sixties has helped in transforming Indian economy self-reliant in food production but also been able to generate sizable surplus for export. Intensive agriculture involving fertilizers and chemicals led to undesirable consequences like wide spread soil erosion, decline in soil quality, unfavourable soil tilth all leading to ill health of soil, pesticide pollution and loss of biodiversity. There is a necessity to rationalize chemical inputs so as to preserve the natural ecosystem and enable sustainable agriculture. Organic agriculture is projected as an answer to all the ill effects of chemical farming.

India is the major producer, consumer and exporter of spices in the world, growing about 60 different varieties of spices and produces about 94 lakh MT of spices, of which, about 9.6

lakh MT (10%) is exported to more than 150 countries. Since organic foods are free from chemical contaminants, the demand for these products is steadily increasing. Organic farming is a form of agriculture that relies on techniques such as crop rotation, green manure, compost and biological pest control. In this system only natural fertilizers and pesticides are allowed, but it excludes or strictly limits the use of synthetic fertilizers and pesticides, plant growth regulators such as hormones, genetically modified organisms, human sewage sludge and nano materials. The organic farming does not aim only at higher crop yield or returns but also developing long term self-sustainable practices. With the increasing demand for organic foods, the demand for spices and spice products are also steadily increasing.



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Turmeric (*Curcuma longa*) (Family: Zingiberaceae) is used as condiment, dye, drug and cosmetic in addition to its use in religious ceremonies. India is the leading producer and exporter of turmeric in the world. Andhra Pradesh, Telengana, Tamil Nadu, Odisha, Karnataka, West Bengal, Gujarat, Meghalaya, Maharashtra, Assam are some of the important states cultivating turmeric, of which, Talangana, Andhra Pradesh and Karnataka contribute to 38% of area and 57.6% of production. During 2018-19, the country produced 9.4 lakh tonnes of turmeric from an area of 2.45 lakh ha. India exports only 6.48% of its production of turmeric

to more than 50 countries mainly as dry produce (63%) and powder (37%). In world market the share of organic turmeric is only 11% compared to conventional turmeric. There is a great demand for organic turmeric in USA, Germany, France and Japan and there is a growing demand for organic spices in the market. Growing demand for natural colours in industry, fast food chains, pharmaceuticals offer a potential scope for organic production of turmeric.

In Kerala, turmeric is being cultivated in isolated areas and the cultivated area is very less (2630





ha). There is an ample scope for reducing the cost of cultivation through judicious use of inputs. In Kerala, cultivated coconut area is 7,90,223 ha and only 10% is utilized for intercropping. Turmeric is suitable to cultivate as intercrop in coconut garden. Most of the farmers in Kerala belongs to small and marginal groups and are finding difficult to make ends meet. At the same time they are conscious about soil ill health and health deterioration due to consuming foods having pesticides. Organic package of turmeric consisting application of inputs, such as FYM, Vermicompost, neem cake and neem oil for the pest control, application of Trichoderma and PGPRs for disease control was developed by ICAR-IISR for the benefit of farmers. In order to popularise the technology, the organic package of turmeric was demonstrated as FLD in an area of one acre coconut garden in Kavunthara Panchayat with the help of ICAR-Krishi Vigyan Kendra, Peruvannamuzhi, Kozhikode under MIDH project. The organic cultivation of turmeric was done by women SHG under Service Cooperative Bank in Kavumthara Panchayat.

Before implementing the FLD, training on cultivation of organic turmeric to farmers in Kavumthara panchayat including women SHG group was organized by Directorate of Arecanut and Spices Development, Kozhikode during 2018 with experts from ICAR-IISR, on organic cultivation of turmeric. Attracted by the training programme, a women SHG group consisting 10 members under the leadership of Mrs. Sakeena implemented the organic demonstration programme in Kavumthara Panchayat. This SHG with active farming members of Service Cooperative Bank,

Kavumthara provided good support to registered farmers by arranging improved seeds, inputs, technical knowhow and helped for marketing.

### **Preparation of land and sowing**

The demonstration on organic cultivation of turmeric was carried out during 2019-20. Garden having more than 20 years old coconuts was selected and inter spaces of coconut garden was used for planting turmeric. Land was prepared by digging with spade on the receipt of early monsoon showers during April and beds of 1.0 m width, 30 cm height and of convenient length was prepared with a spacing of 50 cm between beds. Small pits were made at spacing of 25 cm x 25 cm with a hand hoe on the beds and healthy, disease free rhizomes of turmeric (25 g) variety IISR Pragati having 1-2 buds were sown. IISR Pragati is a short duration variety (180 days) having an average yield of 38 t/ha. It is moderately resistant to root knot nematode and has high curcumin (5.02%) across different locations. Local variety of turmeric was used to check under same management conditions.

### **Manuring and Mulching**

Well decomposed cattle manure or compost @ 10 tones/acre, neem cake 800 kg/acre were applied in beds at the time of planting. Vermicompost 800 kg/acre was applied at 45 and 90 days after planting. Ash 250 g/acre was applied at 45 days after planting, to rectify micronutrient deficiency, turmeric micronutrient mixture developed by IISR was sprayed @ 5g/litre of water during 60 and 90 days after planting. The crop was mulched immediately after planting with available

materials such as green leaves, dried coconut leaves etc. Every bit of farm waste was recycled within a farm itself by vermicomposting for which KVK Peruvannamuzhi arranged special trainings with the help of scientists from ICAR-IISR. The crop was also drenched with *Bacillus amyloliquefaciens*, a PGPR formulation for its disease prevention and growth promotion on 30 and 60 DAP. After weeding, manures, were applied at 45 and 90 days after planting followed by mulching and earthing up for proper aeration and for development of rhizomes. No major pest and disease was observed during the growing period.

### Harvesting

The crop was harvested 180 days after planting and cleaned. Yield in the demonstration plots ranged from 60.0 q/acre to 120.0 q/acre with an average of 86.5 q/acre. Yield in the local check ranged from 50 q/acre to 72 q/acre with an average of 58.3 q/acre. Being an improved variety majority of the produce was sold as seed material to needy farmers directly and the remaining as cured turmeric. On an average, yield increase of 11.96 per cent over local check was observed. The total expenditure was Rs.1,56,340/- acre and gained a net returns of Rs.77,078 with a BCR of 1.49 for Pragati and 1.25 for local variety. In normal situation people were not involved in turmeric cultivation due to less profit. But the present awareness about curcumin and its

nutaceutical potentials among the general public given array of hope for farmers for cultivating the crop organically that it fetched good income to SHG.

### Impact

Convinced by the better performance under organic cultivation and due to great demand of organic seed rhizomes of Pragati, Mrs. Sakeena, the group leader told that all cultural operations in their plot was carried out by family members. Success of the seed production programme has also attracted nearby unemployed women as well as farmers and they have come forward to cultivate the variety organically as intercrop in order to enhance income from coconut garden. Thus farmer to farmer spread of the information has further helped in spreading of the production technologies in to other wards of the districts. All the 10 members in the group have decided to cultivate the crop in more area during following seasons. Mrs. Sakeena and group acknowledge the efforts and guidance of scientists from ICAR-IISR and KVK Peruvannamuzhi to achieve the goal and livelihood security.

### Acknowledgement

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## INITIATIVE OF KVK, PHOLODI ON QUALITY SEED PRODUCTION OF CUMIN THROUGH INTEGRATED CROP MANAGEMENT - A SUCCESS STORY

M.L.Mehriya, M.S.Chandawat, Manmohan Puniya and Neelam Geat\*

Cumin is the most important seed spice crop of Western Rajasthan especially for Jodhpur region. Majority of farmers were not using seed treatment, 30% farmers used local seed of cumin for sowing, 70% farmers were dependent on seed variety made available by choice of seed vendors. Blight and wilt are the two major diseases which are responsible for significant yield loss in cumin production. When KVK scientists made base line survey for conducting FLD under CSS-MIDH (DASD) project for quality cumin production, they found that majority of farmers were not aware about the diseases and insect pest management measures etc. Keeping in view this, the observation taken through group discussion with farmers about the constraints faced by them in production of quality cumin production, KVK scientists with the support of Dr.M.L.Mehriya, Project In-charge, CSS-MIDH, Agriculture University, Jodhpur, decided upon the critical input for efficient production of cumin crop.

Shri Bhanwar Lal is young farmer and was enthusiastically interested in adoption of new technological interventions. Krishi Vigyan Kendra, Phalodi (Jodhpur-II), gave Front Line Demonstration on Cumin crop under the Project 'awareness on quality improvement of seed spices" (Directorate of Arecanut & Spices Development, Calicut) implemented by

\* Agriculture University, Jodhpur, Rajasthan.

Agriculture University, Jodhpur. Ten farmers were provided the full package of inputs including improved variety GC-4 and plant protection measures etc. for 0.5 ha area to each farmer. They sincerely followed all the guidelines and advisory of KVK scientists during trainings and meetings for crop cultivation.

KVK, Jodhpur-II provided the inputs looking into the existing field constraints faced by farmers in quality cumin seed production. Full package (Improved seed variety GC-4, bio-agent *Trichoderma*, Oxyfluorfen, Sulphur dust, Thiamethoxam, Mancozeb, surfactant) were provided under demonstration. KVK scientist gave training on scientific cumin crop cultivation supported with continuous field visits, provided critical inputs under Front Line Demonstration (FLD) under MIDH project and also provided technical know-how of scientific cultivation of cumin.

Shri Bhanwar Lal followed all the guidelines of KVK scientists and cultivated the crop accordingly right from field preparation to sowing and harvesting and also motivated fellow farmers for cumin cultivation under guidance of scientists team of Krishi Vigyan Kendra, Jodhpur II. Apart from this, they also followed seed production practices of cumin crop for quality seed production to provide quality seed at farmer's doorstep at lesser price

to other farmers of his village and near by villages. For this he adopted scientific crop cultivation under the guidance of KVK scientist.

**Farmer Feedback**

1. Cumin crop variety GC-4 is more profitable due to higher production than local variety (oftenly used loose seed).
2. Incidence of weeds, aphids and diseases like wilt, blight and powdery mildew was almost negligible due to adoption of ICM approach.
3. He stored the seeds scientifically for sowing in next season because many farmers and companies are interested to purchase these quality cumin seed.

**Outcome - Yield (q/ha)**

- Demonstration - 12.24
- Potential yield of variety/technology - 5.44
- District average (previous year) - 4.95

Seed produced by Shri Bhanwar Lal, not only fetched additional return but also helped

fellow farmers in getting good quality seed with lesser cost at village level as compared to market price of packaged cumin seed of various companies. He sold his cumin seed at Rs.200.00 per kg while in market at that time seed was sold ranging from Rs.280 to Rs.400 per kg of cumin seed. In this situation farmers also saved Rs.80 to Rs.200 per kg by purchasing seed from Shri Bhanwar Lal as well as local availability of seed at their doorstep. He sold above quantity of cumin seed to 26 farmers of nine villages of four tehsils of Jodhpur district. Many farmers now learnt the seed production technique of cumin crop and started believing that they can also product quality cumin seed.

Now he is ready to work as successful seed producer of quality cumin seed and also encouraging many other cumin growing farmers of region for seed production of cumin crop. He now got the taste of success for better future.

**Performance of technology via-a-vis Local check (Increase in productivity and returns)**

Specific Technology	Yield (q/ha)	Cost of cultivation (Rs./ha)	Gross income (Rs./ha)	Net income (Rs./ha)	B:C ratio
Farmer practices	8.18	28,500.00	1,22,700.00	94,200.00	4.30
Demonstration	12.24	32,400.00	1,83,600.00	1,51,200.00	5.67
Difference	4.06	3,900.00	60,900.00	57,000.00	1.37
% Increase	33.33	13.68	33.33	38.46	

**Additional income through seed production :**

Sr. No.	Particulars	Total quantity sold as	Sold @ (Rs./kg)	Price difference (Rs./kg)	Additional income received (Rs.)	Overall profit by quality cumin production/ha. (Net income + Additional income by seed selling)
1.	Cumin Seed	1200 kg	200.0	50.0	60,000.0	2,08,200.0



**Farmer's visit to cumin crop field of Shri Bhanwar Lal during field day  
Village : Sirmandi**



**Field view of Cumin crop  
(variety : GC-4, Village : Sirmandi (Shriram Nagar))**

## कृषि विज्ञान केन्द्र द्वारा जीरे का प्रक्षेत्र दिवस कार्यक्रम

# उन्नत किस्मों का उपयोग करेंगे तो उत्पादन में होगी वृद्धि

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फलोदी, कृषि विज्ञान केन्द्र, फलोदी, कृषि विश्वविद्यालय, जोधपुर द्वारा सुपारी व मसाला विकास निदेशालय के तत्वावधान में शनिवार को सिरमण्डी में जीरे की फसल का प्रक्षेत्र दिवस कार्यक्रम हुआ। इस योजना के अन्तर्गत क्षेत्र के 10 किसानों को रबी जीरा बुवाई के लिए जीसी-4 किस्म के बीज, ट्राइकोडर्मा कल्चर, ओक्सोफ्लोरफेन, धायामिथोक्साम, मेन्कोजेब, स्टल्फर चुण आधा हेक्टेयर का फसल प्रदर्शन दिया गया था।

कार्यक्रम में मसाला विकास परियोजना प्रभारी डॉ. एम.एल. मेहरिया ने किसानों की गुणवत्तायुक्त मसाला उत्पादन करने तथा जीरे के निर्यात योग्य उत्पादन की जानकारी दी। उन्होंने कहा कि मसाला फसलों में उन्नत किस्मों का



फलोदी, कृषि विज्ञान केन्द्र द्वारा सिरमण्डी में आयोजित जीरे का प्रक्षेत्र दिवस कार्यक्रम में उपस्थित वैज्ञानिक व किसान।

उपयोग करें, तो 20-30 प्रतिशत उत्पादन में वृद्धि होगी। उन्होंने मसाला फसलों के बीज उत्पादन व खर्च कम करने की जानकारी दी। डॉ. शालिनी पांडे ने जीरे व अन्य मसाला फसलों में आने वाले कीटों की पहचान व प्रबंधन की जानकारी दी। मुख्य वैज्ञानिक डॉ.

महेन्द्रसिंह पांडेयल ने समय के अनुसार कृषि की नवीन तकनीकों को अपनाने की बात कही।

इस अवसर पर डॉ. मनमोहन पुनिया, भाग्यद ओला, भखरलाल चौधरी, हिम्मताराम, भोमाराम, शंराराम, टीकूराम आदि उपस्थित रहे। (निस)



Media coverage of field day organised at field of Shri Bhanwar Lal

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# अश्वगंधा में कीट विविधता: एक विवेचना

## अभिषेक शुक्ला

**सारांश:** अश्वगंधा हमारे देश की सर्वप्रमुख औषधीय फसल है। इसके औषधीय गुणों के कारण इसका प्रयोग अनेक प्रकार की दवाओं में भी किया जाता है। अश्वगंधा की सफल खेती को अनेकों कारक प्रभावित करते हैं जिनमें समय-समय पर नाशीकीटों की उपस्थिति प्रमुख है। इन कीटों में विभिन्न गण जैसे आर्थोप्टेरा, हेमिप्टेरा तथा कोलियोप्टेरा से संबद्ध कीट प्रमुख हैं। इसके अतिरिक्त अश्वगंधा की खेती के दौरान लाल माईट का भी प्रकोप देखा जाता है। ये सभी नाशीजीव उत्पादन को कम करने के साथ उसकी गुणवत्ता पर भी प्रतिकूल असर डालते हैं।

अश्वगंधा (*विटेनिया सोमेनिफेरा*) हमारे देश में उगायी जाने वाली मुख्य औषधीय फसल है जिसकी खेती हमारे देश में इसके औषधीय गुणों के कारण प्राचीन काल से की जा रही है, ये जंगली अवस्था में भी हमारे देश में उगती है। इन दवाओं का उपयोग आयुर्वेद और यूनानी पद्धति की दवाओं में काफी व्यापक पैमाने पर किया जाता है। अश्वगंधा के पौधे की जड़, छाल, पत्तियों, फलों और बीजों में अनेक ऐल्केलॉइड पाये जाते हैं जिनमें विटेनिया और सोमेनीफिरिन प्रमुख हैं जिनका व्यापारिक स्तर पर दवा बनाने में काफी प्रयोग किया गया है। इनका उपयोग शरीर की भिन्न-भिन्न बीमारियों के इलाज में प्रयोग में लाया जाता है। इस औषधीय फसल में हाड़ा भृंग, हेनोसएपिलेक्ना विजिक्टीयोपंक्टाटा का प्रकोप एक पत्ती खाने वाले कीट के रूप में सबसे अधिक स्थानों पर देखा व पहचाना गया है, मगर इस कीट के अतिरिक्त भी अश्वगंधा

को कुछ अन्य कीट प्रभावित करते हैं। प्रस्तुत लेख में इन कीटों के विषय में संक्षिप्त विवेचना की जा रही है जो कि हमारे अश्वगंधा उत्पादकों के लिये उपयोगी सिद्ध होगी।

अश्वगंधा की खेती के दौरान आर्थोप्टेरा गण के कुछ कीट आक्रिडीडी तथा टेटीगोनिडी कुल से संबद्ध हैं।

**कुल-एक्रिडीडी :** इस कुल में ग्रासहोप्पर, ट्राईलोजडा एन्यूलेटा का प्रकोप देखा गया है। ये कीट भूरे रंग का होता है जिसके शरीर पर काले रंग के धब्बे पाये जाते हैं। इस कीट के पंख जिन्हें टेगमीना कहा जाता है, पर भी दो गहरे भूरे रंग की छल्लेनुमा संरचना पायी जाती है। ये कीट अश्वगंधा की पत्तियों के किनारों को खाता है। इस कीट का उपद्रव सामान्य तौर पर सितंबर से अक्टूबर माह में देखा जाता है।

**कुल-टेटीगोनिडी :** इस कुल में पाये जाने वाले ग्रासहोप्पर का वैज्ञानिक नाम फेनेरोप्टेरा ग्रेसीलिया है इसे लॉन्ग होर्न ग्रासहोप्पर (लंबी एंटीनीवाला ग्रासहोप्पर) कहा जाता है। ये प्रायः हरे रंग के कीट होते हैं। इन कीटों की एंटीनी बहुत ही लंबी होती है। इनके उदर का अंतिम सिरा काफी तीक्ष्ण तथा धारदार होता है। इस कीट के शिशु (निंफ) तथा वयस्क दोनों पत्तियों को खाते हैं। इसके द्वारा पत्तियों पर अनियमित छिद्र बना दिये जाते हैं अश्वगंधा पर इस कीट की उपस्थिति सितंबर से अक्टूबर माह में सर्वाधिक देखी जाती है।

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अश्वगंधा की फसल को कुछ भृंग और घुन भी नुकसान करते पाये जाते हैं। ये कीट कोलियोप्टेरा गण से संबंध रखते हैं। इस गण के अंतर्गत कोक्सीनेलिडी तथा कुरकुलोनिडी कुल के कीट प्रमुख हैं।

**कुल—कोक्सीनेलिडी :** इस कुल में हाड़ा भृंग, हेनोसएपिलेक्ना विजिक्टीयोपंकटाटा का समावेश होता है। इसकी सूंड़ीयां (ग्रब) गोल तथा पीले रंग की होती हैं। इन सूंड़ीयों के शरीर के वक्ष तथा उदर भागों पर कड़े, तीक्ष्ण बाल पाये जाते हैं। वयस्क भृंग के पंख जिनको इलिद्रा के नाम से भी जाना जाता है प्रायः लाल-भूरे रंग के होते हैं तथा इन पर 28 गहरे गोलाकार धब्बे पाये जाते हैं। इस कीट की सूंड़ीयां (ग्रब) तथा वयस्क भृंग दोनों ही पत्तियों की निचली सतह पर रहकर उनको खुरच-खुरच कर हरे भाग को खाते हैं जिससे पत्तियों पर छिद्र बन जाते हैं। इस कीट के अत्यधिक प्रकोप की दशा में पत्तियों की मध्य शिराएं ही शेष रह जाती हैं। इस कीट का प्रकोप अश्वगंधा पर जून-जुलाई माह में सर्वाधिक होता है।

**कुल—कुरकुलोनिडी :** इस कुल में भूरी घुन का प्रकोप अश्वगंधा पर देखा जाता है जिसका वैज्ञानिक नाम माईलोसिरस विरीडेनस है। ये घुन हल्के हरे रंग का, आकार में छोटा होता है जिसके शरीर पर भूरा पदार्थ दिखाई पड़ता है। इस कीट की वयस्क घुन अश्वगंधा की पत्तियों को उनके किनारे से काट-काट कर खाता है। इस कीट की उपस्थिति अगस्त से सितंबर माह तक सबसे अधिक देखी जाती है।

इस कुल की एक अन्य घुन जिसका वैज्ञानिक नाम ब्लोसुरीया इनेक्यूलस है। ये एक मध्यम आकार की घुन है, इसके पंख जिन्हें इलिद्रा के नाम से जाना जाता है, पर उभरी हुई

नसं आसानी से देखी जा सकती है। ये घुन पत्तियों पर छिद्र बनाती है तथा इस कीट का उपद्रव सितंबर माह में अधिक देखा जाता है।

अश्वगंधा की खेती के दौरान कुछ सूंड़ियों का प्रकोप भी देखा जाता है। ये कीटों के लेपिडोप्टेरा गण से संबद्ध हैं। इस गण के वयस्क कीटों को पतंगे तथा तितलीयां कहते हैं। अश्वगंधा को नुकसान करने वाली ये सूंड़ीयां नोक्टुईडी तथा स्पिंजिडी कुल से संबंधित हैं।

**कुल—नोक्टुईडी :** इस कुल में हेलियोथिसे/हेलिकोवार्पा नामक नाशीकीट की सूंड़ीयां नई कोपलों तथा पत्तियों को खाकर नुकसान पहुंचाती हैं। ये पत्तियों पर छिद्र बना देती हैं। इस कीट की सूंड़ियां हरे रंग की होती हैं तथा ये पत्तियों पर आक्रमण करती हैं। अश्वगंधा के खेतों में इसका प्रकोप अक्टूबर माह में अधिक होता है।

इसके अतिरिक्त स्पिंजिडी कुल का एक अन्य कीट जिसका वैज्ञानिक नाम डिलिफीला निरी है। इसकी सूंड़ीयां हरे रंग की होती हैं तथा इनके शरीर के उदर भाग पर कांटेदार संरचना पायी जाती है। इस कीट की सूंड़ीयां पत्तियों को उनके किनारों से खाती हैं और इसकी उपस्थिति प्रायः सितंबर माह में अधिक देखी जाती है।

उक्त वर्णित कीटों के अलावा अश्वगंधा की खेती के दौरान हेमिप्टेरा गण के कीटों की उपस्थिति दर्ज की जाती है। इस गण के निम्न कुलों के कीट अश्वगंधा पर देखे जाते हैं।

**कुल—सिकाडिलेडी :** इस कुल में प्रथम कीट जिसका वैज्ञानिक नाम पेंथिमिया प्रजाति है। ये काले रंग का पर्णफुदका है। इनके पंखों के दूरस्थ छोर वाले भाग पारदर्शी होते हैं, जबकि



बीच का भाग कठोर काले रंग का होता है। इस कीट के शिशु (निंफ) तथा वयस्क पत्तियों तथा प्ररोहों पर रह कर उनसे सतत रस चूसते रहते हैं। इस कीट की उपस्थिति सितंबर माह में अधिक देखी जाती है। इसके द्वारा ग्रस्त पौधों की पत्तियाँ पीली पड़ जाती है।

**कुल-मेंब्रीसीडी :** इस कुल के कीटों को पेड़ों का फुदका (ट्री-होप्पर) कहा जाता है। इस कीट का वैज्ञानिक नाम गार्गोरा मिक्सटा है। इनके पंखों का रंग कट्थाई होता है जिन पर हल्के सफ़ेद धब्बे पाये जाते हैं तथा इनका प्रोनोटम पीछे की तरफ लंबा होता है। इस कीट के शिशु

**तालिका 1 : अश्वगंधा को ग्रसित करने वाले कीट**

कीट प्रजाति	कुलगण	नुकसान की प्रकृति/पौधों के ग्रसित भाग	नाशीकीट स्थिति
ट्राइलोजिडा एन्यूलेटा	एक्रिडीडी / आर्थोप्टेरा	पत्तियों को किनारे से काट कर खाता है	गौण कीट, कभी-कभी प्रकोप होता है।
फेनेरोप्टेरा ग्रेसीलिया	टेटीगोनिडी / आर्थोप्टेरा	पत्तियों को काट कर उनपर अनियमित छिद्र बना देता है।	गौण कीट, कभी-कभी प्रकोप होता है।
पेंथिमिया	सिकाडिलेडी / हेमिप्टेरा	पत्तियों से लगातार रस चूसता है जिससे पौधे पीले पड़ कर सूख जाते हैं।	गौण कीट, कभी-कभी प्रकोप होता है।
गार्गोरा मिक्सटा	मेंब्रीसीडी / हेमिप्टेरा	कोमल प्ररोहों तथा नई पत्तियों से रस चूसता है तथा मधुरस उत्सर्जित करता है।	गौण कीट, कभी-कभी मौसमी प्रकोप होता है।
आर्थोजिया इन्सीग्निया	आर्थोजिडी / हेमिप्टेरा	पौधों के कोमल प्ररोहों तथा पत्तियों से रस चूसने के कारण पत्तियां पीली पड़ जाती है।	गौण कीट, कभी-कभी मौसमी प्रकोप होता है।
कोक्सीडोहेस्ट्रीक्स इन्सुलेटस	स्यूडोकोक्सीडी / हेमिप्टेरा	कोमल प्ररोहों तथा पत्तियों की निचली सतह से रस चूसता है तथा मधुरस उत्सर्जित करता है। कीटग्रस्त पौधे पीले पड़ जाते हैं तथा बाद में सूख जाते हैं।	प्रमुख कीट, कभी-कभी मौसमी प्रकोप होता है।
हेलियोथिस	नोक्टुईडी / लेपिडोप्टेरा	नई पत्तियों को काट कर उन पर छिद्र बना देते हैं।	गौण कीट, कभी-कभी मौसमी प्रकोप होता है।
डिलिफीला निरी	स्पिंजिडी / लेपिडोप्टेरा	पत्तियों को उनके किनारे से काट देते हैं।	गौण कीट, कभी-कभी मौसमी प्रकोप होता है।
हेनोसएपिलेक्ना विजिक्टीयोपंकटाटा	कोक्सीनेलिडी / कोलियोप्टेरा	पत्तियों को खुरच-खुरच करते हैं।	गौण कीट, कभी-कभी मौसमी प्रकोप होता है।
माइल्लोसिरस विरीडेनस	कुरकुलोनिडी कोलियोप्टेरा	पत्तियों को उनके किनारे से काट देते हैं।	गौण कीट, कभी-कभी मौसमी प्रकोप होता है।
टेट्रानिकस आर्टिकी	टेट्रानिकीडी / एकेरी	पत्तियों से लगातार रस चूसती है। पौधे कमजोर होते हैं तथा पत्तियां झड़ जाती है।	आजकल ये प्रमुख नाशीजीव के रूप में देखा जा रहा है।

(निंफ) तथा वयस्क अश्वगंध की प्ररोहों से रस चूसते हैं। रस चूसने के साथ ये अपने शरीर से मधुरस (हनीड्यू) का उत्सर्जन भी करते हैं जो कि पत्तियों पर फैल जाता है और उस पर काले रंग की फफूंदी उग जाती है। ये काली फफूंदी, पत्तियों के प्रकाश संश्लेषण क्रिया में विघ्न पैदा करती है इसके कारण पौधों के उत्पादन पर प्रतिकूल असर पड़ता है। इस कीट से ग्रस्त पौधों पर चींटियों की बड़ी भारी संख्या दर्ज की जाती है। अश्वगंध पर इस कीट की उपस्थिति जुलाई से नवम्बर माह में सर्वाधिक देखी जाती है।

**कुल—आर्थोजिडी :** इस कीट का वैज्ञानिक नाम आर्थोजिया इन्सीग्निया है। ये कीट आकार में बहुत छोटे बग होते हैं। इनके शरीर की बाहरी सतह मोमीय आवरण से ढंकी होती है। इस कीट के शिशु (निंफ) तथा वयस्क, दोनों ही पौधों के कोमल भागों व कोमल प्ररोहों से लगातार रस चूसते हैं जिससे उन पर पीले रंग के धब्बे बन जाते हैं। इस कीट का अधिकतम उपस्थिति प्रायः जुलाई से दिसंबर माह में अधिक होता है जबकि इस कीट की सर्वाधिक गतिविधियों तथा नुकसान अगस्त माह में देखी जाती है।

**कुल—स्यूडोकोक्सीडी:** इस कुल से संबद्ध कीट का वैज्ञानिक नाम कोक्सीडोहेस्ट्रीक्स

इन्सुलेटस है। इस कीट के शिशु (निंफ) तथा वयस्क दोनों ही अश्वगंधा की पत्तियों की निचली सतह से लगातार रस चूसते रहते हैं। इस कीट की उपस्थिति अश्वगंधा के पौधों पर अगस्त से अक्टूबर तक सर्वाधिक होती है। इस कीट के प्रकोप से पत्तियां पीली पड़ जाती है जो कि बाद में सूख जाती है। इस कीट का अधिकतम प्रकोप (50% से अधिक संक्रमण) सितंबर माह में देखा जाता है।

**अन्य नाशीजीव—लाल माईट (रेड स्पाईडर माईट):** इस जीव का वैज्ञानिक नाम, टेट्रानिकस आर्टीकी है। यहां पर सर्वप्रथम हमें ये बात ध्यान में रखना चाहिए कि माईट कीट नहीं होती है। वयस्क माईट में चार जोड़ी पैर होते हैं। इस जीव के वक्ष भाग पर दो काले धब्बे पाये जाते हैं। ये जीव आकार में बहुत ही सूक्ष्म होती है। ये जीव अश्वगंधा को पत्तियों पर समूहों में रहता है तथा जाले बना कर पत्तियों से लगातार रस चूसते रहते हैं। इस जीव द्वारा लगातार रस चूसने के कारण अश्वगंध की पत्तियों पर पीले धब्बे बन जाते हैं जो बाद में आपस में मिलकर आकार में और बड़े हो जाते हैं। माईट से ग्रस्त अश्वगंधा की पत्तियां आकार में छोटी रह जाती है तथा उपज की गुणवत्ता में भारी गिरावट आती है जिससे उपज पर प्रतिकूल असर पड़ता है। इससे किसानों को भारी आर्थिक नुकसान उठाना पड़ता है।

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## A REPORT ON 14<sup>th</sup> ANNUAL REVIEW MEETING OF THE MIDH PROGRAMMES ON SPICES

The fourteenth Annual Review Meeting of the MIDH programmes implemented through the Directorate of Arecanut and Spices Development, was held on 28-29 July, 2020 through video conferencing. There were 53 participants representing 45 agencies implementing DASD programmes.

The inaugural session began at 10.00 AM. Dr. Femina, Deputy Director delivered the introductory remarks. Dr. Homey Cheriyan, Director, DASD delivered the formal welcome address. Dr. B.N.S. Murthy, Horticulture Commissioner, Govt. of India was the Chief Guest and inaugurated the review meeting. In his inaugural address, he highlighted that the demand for spices is expected to increase in the post COVID period. The production/productivity improvement made in NHM period to meet export and domestic demand is remarkable. He also appreciated the efforts done by DASD in Rajasthan to develop export clusters for pesticide free cumin production. He assured support from Ministry in the efforts to address post COVID difficulties in spices sector. Dr. S.K. Rao, Hon'ble Vice Chancellor, RVSKVV also addressed the audience.

The technical sessions began at 10.30 AM. The Review Team consisted of Dr. B.N.S. Murthy, Horticulture Commissioner, Dr. Homey Cheriyan, Director, DASD and Dr. Femina, Deputy Director, DASD. Centre/Institute wise presentations were done by Principal Investigators/ representative of the

implementing agencies and the review team critically evaluated the progress of implementation in each centre. Suggestions were made for effective implementation of the development programmes.

Following points were mentioned by the Director, DASD in his closing remarks:

1. Unspent balance of Seminar/Workshop/Farmer's training programme - The balance funds may be utilized for some purpose connected with the event. The balance of unspent funds of Seminars/FT must be refunded, if not utilized fully. Any funds being refunded to the Govt. of India under MIDH has to be in the name of Director, DASD, Calicut. Detailed report on the programme along with soft copy of photographs (in JPEG format) must be sent to the Directorate.
2. The implementing agencies may ensure that funds of the immediate previous year are only lying unspent with them. Funds of the previous years may be utilized completely, as revalidation of funds left unspent for more than 2 years is not permitted. Revalidated funds of the previous years are to be utilized only for the already approved components and these funds are to be utilised first, before the current year's funds are used. Year wise details of unspent balance may not be mentioned. Total opening balance, release,

expenditure and unspent balance only are to be given in the APR.

3. MIDH/NHM logo to be placed at all places where funds under NHM are utilized, such as infrastructure, fields, nursery, seminar, farmer's training etc.
4. All nurseries established under NHM funds from the Directorate should be accredited by DASD. Private /public spice nurseries in contact with the University may be encouraged to take up nursery accreditation.
5. Submission of Audited Utilisation Certificates are mandatory. Therefore, all agencies may ensure submission of the same within 2 years after implementation.
6. The varieties used in multiplication should be declared at the time of proposal itself. Details of planting material distributed is to be intimated to DASD. The reports on planting material production should show the variety of the crop produced. Those varieties which are released in last 10 years are to be given priority for multiplication under the programme.
7. Details of the planting material produced at each centre to be uploaded on the DASD website.
8. Articles, success stories in connection with the conduct of the FLDs, innovative projects, infrastructure development, skill trainings, Seminars etc. to be submitted to the Directorate for publication in Journal.
9. Impact of skill development programme, to be intimated to DASD in form of success stories.
10. Refund of funds to DASD - Funds liable to be refunded to DASD may be done only after approval/directions of DASD.

The two-day review meeting was concluded with the formal Vote of Thanks delivered by Dr. Femina, Deputy Director, DASD.



Dr. Homey Cheriyan, Director, DASD giving the welcome address



A view of the DASD officials participating in the meeting

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## हिंदी पखवाड़ा समारोह – 2020 की रिपोर्ट

भारत सरकार की राजभाषा नीति के अनुरूप हिंदी के प्रयोग को बढ़ावा देने के लिए अनुकूल वातावरण बनाने के उद्देश्य से निदेशालय में हिंदी पखवाड़ा आयोजित किया गया। 14 सितंबर, 2020 को हिंदी पखवाड़ा का शुभारंभ किया। इस सिलसिले में आयोजित बैठक में डॉ. होमी चेरियान, निदेशक ने दीप जलाकर पखवाड़ा का उद्घाटन किया। उन्होंने सभी स्टाफ सदस्यों को पत्राचार, टिप्पण आदि में हिंदी के प्रयोग बढ़ाकर उत्तरोत्तर प्रगति लाने का अनुरोध किया। डॉ. फेमिना, उप निदेशक ने स्वागत भाषण में कहा कि कार्यालय में हिंदी का प्रयोग बढ़ गया है और अधिकाधिक फाइलों में टिप्पणियाँ हिंदी में देख रहे हैं, जो बहुत सराहनीय है।

श्री. बाबुलाल मीणा, उप निदेशक ने अपने भाषण में कहा कि हिंदी के प्रयोग को बढ़ाकर वार्षिक कार्यक्रम में निर्धारित लक्ष्य प्राप्त करना बहुत जरूरी है। श्री. सनमुख सुंदरम, अधीक्षक ने कहा कि अनेकता में एकता भारत की पहचान है। इसको कायम रखने में हिंदी का स्थान महत्वपूर्ण है। डॉ. पी.एन.ज्योति, कनिष्ठ अनुवादक ने हिंदी के प्रयोग में मदद देने की सुविधाओं का विवरण किया और कार्यालय में उपलब्ध संदर्भ सामग्रियों के प्रयोग करने का अनुरोध किया। साथ ही उन्होंने पखवाड़ा के लिए प्रस्तावित कार्यक्रमों का ब्योरा प्रस्तुत किया।

कर्मचारियों के बीच राजभाषा का प्रयोग बढ़ाने के उद्देश्य से इस अवसर पर कार्यालयीन टिप्पणियों और विभिन्न अनुभागों में प्रयुक्त द्विभाषी प्रोफार्मे, जॉच-बिंदुओं आदि का संकलन द्विभाषी रूप में तैयार करके वितरण किया गया।

हिंदी भाषा के प्रचार-प्रसार करने के उद्देश्य से राजभाषा विभाग द्वारा तैयार की गई हिंदी भाषा के महत्व से संबंधित सुक्तियों के पोस्टर बनाकर कार्यालय में प्रदर्शन किया गया।

कर्मचारियों को हिंदी के प्रयोग में प्रशिक्षण देने के उद्देश्य से 17-09-2020 को हिंदी कार्यशाला आयोजित किया गया। कोविड-19 महामारी को ध्यान में रखते हुए कार्यशाला ऑनलाइन रूप से चलाया गया, जिस में कर्मचारी भविष्य निधि कार्यालय के वरिष्ठ अनुवाद अधिकारी श्री. एम. अरविंदाक्षन ने राजभाषा नीति, नियमों और अधिनियम पर क्लास चलाया और अभ्यास कराया।

कर्मचारियों को हिंदी के प्रयोग के लिए प्रेरणा एवं प्रोत्साहन देकर हिंदी के प्रति रुचि बढ़ाने के उद्देश्य से पखवाड़े के दौरान हिंदी में विभिन्न प्रतियोगिताएँ आयोजित की गईं। निबंध-लेखन, टिप्पण-आलेखन, टंकण, तकनीकी शब्दावली, हस्तलिपि, अंताक्षरी, हिंदी वाचन आदि प्रतियोगिताएँ चलाई गईं। राजभाषा से संबंधित प्रश्नों को शामिल करते हुए हिंदी में प्रश्नोत्तरी कार्यक्रम चलाया गया।

हिंदी पखवाड़ा का समापन समारोह डॉ. होमी चेरियान, निदेशक की अध्यक्षता में संपन्न हुआ। डॉ. फेमिना, उप निदेशक ने स्वागत भाषण दिया। डॉ. होमी चेरियान, निदेशक ने अपने अध्यक्षीय भाषण में कहा कि कार्यालय में हिंदी के प्रयोग बढ़ाने के लिए हिंदी पखवाड़ा से प्रेरणा एवं प्रोत्साहन मिल रहा है। श्री. बाबुलाल मीणा, उप निदेशक एवं हिंदी संपर्क अधिकारी ने कहा कि पखवाड़ा के आयोजन से कार्यालय में

हिंदी का माहौल बनता है और कर्मचारियों बड़े उत्साह से हिंदी कार्यक्रमों में भाग ले रहे हैं।

डॉ. पी.एन.ज्योति, कनिष्ठ अनुवादक ने हिंदी पखवाड़ा के दौरान आयोजित कार्यक्रमों की रिपोर्ट प्रस्तुत की। साथ ही उन्होंने अनुरोध किया कि कार्यालय में राजभाषा नियमों का पालन सुनिश्चित करने के लिए हर अनुभाग से जारी करने वाले पत्र हिंदी या द्विभाषी रूप में भेजे। वार्षिक कार्यक्रम में निर्धारित लक्ष्य प्राप्त करने के लिए यह अनिवार्य है।



डॉ. होमी चेरियान, निदेशक हिंदी पखवाड़ा का उद्घाटन करते हुए।

श्री. टी. श्रीकुमार, अवर श्रेणी लिपिक ने हिंदी भाषा से संबंधित सूक्तियों का पढ़न किया।

डॉ. होमी चेरियान, निदेशक ने हिंदी प्रतियोगिताओं के विजेताओं को पुरस्कार वितरण किया श्रीमति. श्रुति श्रीकुमार, सॉख्यकीय सहायक ने धन्यवाद ज्ञापन किया।

राष्ट्रगीत के साथ समारोह समाप्त हुआ।



डॉ. फेमिना, उप निदेशक भाषण देती हुई।



श्री. बाबुलाल मीणा, उप निदेशक भाषण देते हुए।



श्री.सनमुख सुंदरम, अधीक्षक भाषण देते हुए।



डॉ. होमी चेरियान, निदेशक ऑनलाइन कार्यशाला में भाग लेते हुए।



डॉ. होमी चेरियान, निदेशक मुख्य भाषण देते हुए।



पुरस्कार वितरण



प्रेक्षकगण

## सुपारी और मसाले के लिए अक्टूबर-दिसंबर के कृषि कार्य

### सुपारी (अरीका कैटेच्यु )

#### पौधशाला

अक्टूबर-दिसंबर के दौरान पौधशाला में निम्नलिखित काम करना चाहिए।

- \* निराई करे और कीटों और रोग संक्रमण के लिए निगरानी रखें।
- \* वर्षा की लभ्यता के अनुसार सिंचाई करें।
- \* मातृ पेड़ों, गुच्छों और बेरियों को बीज के लिए चुनकर प्रारंभिक रोपणियों में, या क्यारियों में या पॉली बैगों में बुआई करें।

बीजों को 1.5 मीटर चौड़ी और सुविधा अनुसार लंबी रेतीली क्यारियों में मूल अग्र ऊपर की दिशा में रखकर 5 सेंटी मीटर की दूरी पर बुआई करें।

6" x 9" आकार 250 गेज के छिद्रवाले पॉली बैगों में मिट्टी, फार्म यार्ड खाद, रूत को 2:1:1 अनुपाद में पोष्टिक किश्रण भर दें। यदि पौदों को ज्यादा समय तक पौधशाला में रखना है तो, बड़े वाले पॉली बैगों में बुआई करे। भूसाया सुपारी के पत्तों से अच्छी तरह पलवार करें। क्यारियों में होस स्पिंगलर मिस्टिंग द्वारा रोज सिंचाई करें।

दिसंबर के दौरान प्रारंभिक रोपणियों में या क्यारियों या पॉली बैगों में बुआई जारी रखा जाए। पौधशाला में छाँव जाल से आवरण करके खरपतवार निकालने के साथ-साथ रोज सिंचाई करें।

#### नया बाग

- \* तरुण पौधों के आधार में मिट्टी चढ़ाना और

एंकरिंग करना ज़रूरी है।

- \* हल्की खुदाई करके उर्वरक देना चाहिए (यदि सितंबर में नहीं किया है तो)।
- \* आवरण फसलों को हरी खाद के रूप में मिट्टी में सम्मिलित करें।
- \* ड्रिप सिंचाई के लिए पाइप लाइन और ट्यूबों को लगा दें।
- \* सप्ताह में एक बार सिंचाई करें।
- \* सुपारी/नारियल के पत्तों से छाँव देना चाहिए।
- \* नए बागों में सुपारी के पत्तों से अच्छी तरह पलवार करें।

#### पुराना बाग

#### पौध संरक्षण

- \* जब कभी आवश्यक हो, नाई और गुडाई करें।
- \* एकल फसल बागों में पौधों के बीचवाली जगहों में खुदाई करें।
- \* यदि सितंबर में नहीं किया है तो, खाद एवं उर्वरकों का प्रयोग करें।
- \* आवरण फसलों को काट कर हरी खाद के रूप में मिट्टी में सम्मिलित करें।

उर्वरकों और खाद का प्रयोग अक्टूबर तक पूरा करें। साधारण किस्माकें के लिए 50 ग्राम नत्रजन, 20 ग्राम फोसफोरस और 70ग्राम पोटाश तथा मंगला एवं अन्य उन्नत उपज वाली किस्माकें के लिए 75 ग्राम नत्रजन, 30 ग्राम फोसफोरस और 105 ग्राम पोटाश प्रति पेड़की दर से उर्वरकों का प्रयोग करें। पौधों के तने से



75 से.मी.से एक मीटर की दूरी पर 15 से 20 से.मी. की गहराई में गोबर की खाद या कंपोस्ट 12 कि.ग्रा. हरे पत्ते प्रति पोधे की दर से प्रयोग करना चाहिए। नीचे के इलाकों में जड़ों के ऊपर जाती मिट्टी चढ़ाना आवश्यक है।

मानसून की समाप्ति से सुपारी के बागों और पौधशाला में सिंचाई शुरू करें। सिंचाई की नालियाँ साफ करके हफ्ते में एक बार 175 लिटर पानी प्रति पेड़ की दर से सिंचाई करें। जहाँ पानी की कमी है, वहाँ ड्रिप सिंचाई करें। इस महीने से गर्मी की मौसम समाप्त होने तक उर्वरक का प्रयोग शुरू करें। पश्चिमी तटों में जहाँ अधिकांश सुपारी के बागों सिंचित है, वहाँ नवंबर-दिसंबर के दौरान सात-आठ दिनों में एक बार सिंचाई शुरू करें।

दक्षिणी-पश्चिमी सूर्यताप के शिकार सुपारी के पौधों को सूर्याघात और इसके फलस्वरूप होने वाले तना टूटने से बचाने की ज़रूरत है। ऐसी स्थिति में इनके तने के हरे भागों को सुपारी की पत्तियों/पत्ति आवरणों या अपारदर्शी पॉलिथीन पटल से ढँकना चाहिए।

नारंगी रंग के माइट्स के आक्रमण को गुच्छों में 0.05% डिमेटोथेट छिड़ककर रोका जा सकता है। यदि कीटों का आक्रमण फिर भी रहे तो, 45 दिन बाद छिड़काव दोहराना चाहिए।

मुकुट के नई अविकसित तरुण पत्तियों में काली रेखाओं के रूप में स्पिंडल बग का संक्रमण देखा जा सकता है। सुपारी पेड़ों के स्पिंडल के रोग संक्रमित भागों में डिमेटोथेट (रोग 30 ईसी) 15 मि.लि. प्रति 0 लिटर पानी की दर से छिड़कने से इस कीट को प्रभावपूर्ण ढंग से नियंत्रित किया जा सकता है। धूप के दिन को छोड़कर बहुत महीन छिड़काव करना चाहिए। जड़ ग्रब के नियंत्रण के लिए पर्याप्त जल निकास की व्यवस्था करें। पौधों के आधार से 10-15 से.मी. की गहराई में पेड़ के आसपास की मिट्टी को ढीला करें और 0.04% क्लोरपाइरिफोस से

दो बार उपचार करें, पहला मई में, दक्षिणी-पश्चिमी पानसून के पूर्व और दूसरा सितंबर-अक्टूबर में मानसून के अंत में।

तरुण बेरियों के लिए तुड़ाई पूरा करें और सूखे बेरी (चाली) के लिए तुड़ाई शुरू करें। कठोर ज़मीन वाली जगहों के लंबे पेड़ों से तुड़ाई करते समय रस्सी की सहायता से करनी चाहिए।

## मसाले

### काली मिर्च

बेलों को आधारी पेड़ों से बांधना और तरुण बेलों पर छाया देना आदि नियमित रूप से करें। पुराने पौधों से अनावश्यक शाखाएँ काट लें। खरपतवार निकालने के साथ साथ पूरे बाग में आधारी पेड़ों से एक मीटर की दूरी पर खोदना चाहिए ताकि जड़तंत्र को किसी प्रकार की नुकसान न हो। फाइलोडी और स्टंट रोग (वाइरल) के लक्षण वाले पौधों को चुनकर तोड़ दें।

काली मिर्च के गुणवत्ता वाले बेलों को प्रवर्धन के लिए भूस्तारियों को युनकर मार्किंग करके रखा जाए। केवल उच्च उत्पादन वाले मातृ बेलों को चुन लें। मातृ बेलों को चुनते समय 5-12 वर्ष वाले और नियमित रूप से उच्च उपज देने वाले एवं रोग मुक्त बेलों को चुन लें। युने हुए भूस्तारियों को वलय बनाकर आधारों से बांध लें ताकि जड़ों मिट्टि से न टकराए।

पोल्लू के नियंत्रण के लिए डिमेटोथेट या क्विनालफोस के दूसरे दौर का छिड़काव (2 मि. लि. प्रति लिटर पानी की दर से) अक्टूबर के प्रथम पक्ष में किया जा सकता है। जनू-जुलाई और सितंबर-अक्टूबर में क्विनालफोस (0.05%) और अगस्त, सितंबर और अक्टूबर में नीमगोल्ड (0.6%) (नीम आधारित कीटनाशी) का छिड़काव करने से फंगल पोल्लू के आक्रमण को रोक जा सकता है। पत्तों के निचले भाग (जहाँ वयस्क कीट देखा जाता है) और गुच्छों में पूर्णतः छिड़कना

चाहिए। फंगल पोल्सू को रोकने के लिए डाइथेन z-78 या जिनेब 2 ग्राम प्रति लिटर छिड़कना चाहिए। यदि मानसून दीर्घ काल तक रहे तो, बेलों के आकार के अनुसार पोटेशियम फोस्फोनेट 3 मि.लि. प्रति लिटर की दर पर बेलों के आधार को भिगो देना चाहिए। जड़ मीली बग को रोकने के लिए प्रभावित बेलों को 0.075% क्लोरपाइरीफोस से उपचार करें। स्केल कीट संक्रमण देखा जाए तो, 0.3% नीमगोल्ड छिड़कना चाहिए। यदि संक्रमण निरंतर है तो, 15 दिनों के बाद दुबारा छिड़कना चाहिए। जब इसका प्रकोप भयंकर है तो, संक्रमित शाखाओं को काट लें 0.1% डिमथोएट छिड़का दें और 21 दिनों के बाद दोहराए। यदि बेलों में बेरियाँ हैं तो, इनकी तुड़ाई करने के बाद ही छिड़काव करना चाहिए।

मैदानी इलाकों में तुड़ाई शुरू करें। काली मिर्च में गुण-वृद्धि के लिए गुच्छों से अलग की गई मिर्च को छिद्रवाले बर्तन में उबलते हुए पानी में एक मिनट डुबाने के बाद धूप में सुखाना चाहिए

### अदरक और हल्दी (ज़िन्जिबर ओफिसिनेल : कुरक्युमा लोंगा)

प्ररोह वेधकों का आक्रमण देखा जाए तो 0.05% डिमथोएट (फोस्फामिडोन) का छिड़काव करें या किसी दानेदार कीटनाशी का मिट्टी में प्रयोग करें। यदि पर्णदाग रोग की सूचना मिले तो डाइथेन एम-45 0.2% सान्द्रता में या 1% बोर्डो मिश्रण का प्रयोग करें।

पानी के जमाव से बचने के लिए पर्याप्त जलनिकास करना चाहिए। बीज प्राप्त करने के लिए रोग मुक्त स्वस्थ क्यारियों को चुनकर पूर्ण परिपक्वता के लिए अलग रखना चाहिए।

मोटे प्रकन्दों के रूपीकरण के लिए खरपतवार निकालने एवं मिट्टी चढ़ाने के अंतिम दौर करें।

अब अदरक और हल्दी तुड़ाई के लिए तैयार की स्थिति में होंगे। जब पत्ते पीले रंग के होकर सूखने

लगते हैं, तब प्रकन्दों की खुदाई की जा सकती है। कटाई के बाद प्रकन्दों से लगे जड़ों को काटकर पानी में साफ करके रखें।

### मिर्च (क्याप्सिकम अन्नम)

देर से बोयी गई सर्दी मौसम की फसलों को बुआई के 45 दिनों के बाद नत्रजनात्मक उर्वरकों का प्रयोग करना चाहिए। फसल में खाद देने के लिए 20 से 25 कि. ग्राम नत्रजन प्रति हेक्टेयर की दर से प्रयोग करना चाहिए। यदि आवश्यक है तो निराई करें। मई-जून में बोये गए पौधों को संरक्षण क्रियाएं बहुत आवश्यक हैं। थ्रिप्स के नियंत्रण के लिए 15 दिन के अंतराल से डाइमथोएट 0.025% का छिड़काव करना चाहिए। फसल वेधकों के नियंत्रण के लिए 0.025% क्विनालफोस का छिड़काव करें। कीटों के प्रभाव की तीव्रता के अनुसार पाक्षिक अंतराल में छिड़काव दोहराया जा सकता है। फल गलन और डाइबेक के नियंत्रण के लिए 15 दिनों के अंतराल में 2.5 ग्राम डाइथेन एम 45 या 3 ग्राम बाविस्टन प्रति लिटर पानी की दर से छिड़कना चाहिए।

### वृक्ष मसाले

नए रोपित पौधों और तरुण पौधों पर पर्याप्त छाया का प्रबंध करना चाहिए। मिट्टी की नमी संरक्षित करने के लिए पौधों के तने के चारों ओर खोदकर उसे हरे पत्तों से ढँकना वाँछनीय है। तनाव-वेधकों के नियंत्रण के लिए रोगनिवारक उपाय के रूप में 0.05% डिमथोएट का छिड़काव करना चाहिए। स्केल और मीली बग की रोकथाम के लिए 0.05% सांद्रता में डाइमथोएट (रोगर) का छिड़काव करना चाहिए।

### बीजीय मसाले

#### धनिया (कोरियान्ड्रम साटैवम)

बुआई का उचित समय अक्टूबर मध्य से नवंबर मध्य तक है। अर्सेचित स्थिति में बुआई के पहले करीब 15 टन गोबर की खाद खुराक के रूप में और

20 कि. ग्राम नत्रजन, 30 कि. ग्राम फासफोरस और 20 कि. ग्राम पोटेश प्रति हेक्टेयर प्रयोग करना चाहिए। सिंचित स्थिति में नत्रजन की मात्रा 50 कि. ग्राम बढ़ाकर इसका आधा भाग और फासफोरस तथा पोटेश पूरा मिलाकर पौधों की जड़ों में प्रयोग करना चाहिए और नत्रजन का आधा मात्रा फसल में खाद देने के लिए प्रयोग किया जा सकता है। शुद्ध फसल के लिए 10 से 15 कि. ग्राम और मिश्रित फसल के लिए 5 से 6 कि. ग्राम प्रति हेक्टेयर की दर में बीजों का प्रयोग करना चाहिए। एक किलो ग्राम बीज के लिए 2 ग्राम कवकनाशी की दर से बीजोपचार प्रयोग करना चाहिए। 25 से.मी. की दूरी पर बनाई गई पंक्तियों में बीजों की बुआई की जानी चाहिए। बुआई के तुरंत बाद पहली सिंचाई करनी चाहिए।

चूर्णीय फंफूँदी के नियंत्रण के लिए 0.2% आर्द्र सल्फर का छिड़काव एक बार फूल लगने की अवस्था में और दोबारा 15 दिन बाद करना चाहिए। फसल पर 20 से 25 कि. ग्राम सल्फर प्रति हेक्टेयर का छिड़काव रोग पर नियंत्रण पाने के लिए प्रभावकारी है। माहू के नियंत्रण के लिए 0.05% डिमेक्रोन या रोगर छिड़का दें।

### जीरा (*क्युमिनम सिमिनम*)

बुआई का उचित समय नवंबर मध्य से दिसंबर के प्रथम सप्ताह तक है। मूल खुराक के रूप में गोबर की खाद 15 से 20 टन प्रति हेक्टेयर प्रयोग करना चाहिए। 50 कि. ग्राम नत्रजन, 20 कि. ग्राम फासफोरस प्रति हेक्टेयर की दर से उर्वरकों का प्रयोग करें। अनुकूलतम बीज - दर 12 से 15 कि. ग्राम प्रति हेक्टेयर हैं। बुआई के पहले बीजों को 2 ग्राम/ कि. ग्राम की दर पर कवकनाशी से उपचारित करना चाहिए। बीजों को 15 से. मी. से 30 से. मी. की दूरी में बोना चाहिए या चिट्टा बुआई करें। चूर्णीय फंफूँदी की रोकथाम के लिए आर्द्र सल्फर या चूर्ण का प्रयोग करना चाहिए।

माहू के आक्रमण को रोकने के लिए चूर्णीय फासफामिडोन या डिमेथोएट का प्रयोग करना चाहिए।

### सौंफ (*फोनिकुलम वल्गोयर*)

बुआई का समय अक्तूबर मध्य से नवंबर मध्य तक है। 15 टन गोबर की खाद आधारीय रूप में प्रयोग करने के अतिरिक्त 20 कि. ग्राम नत्रजन, 30 कि. ग्राम फासफोरस प्रति हेक्टेयर की दर पर उर्वरकों का प्रयोग करना चाहिए। 9 से 12 कि. ग्राम प्रति हेक्टेयर की दर से बीज प्रयोग कर 40 से 60 से. मी. दूरी की पंक्तियों में बुआई करना चाहिए। जल्दी उगाई के लिए बुआई के पहले बीजों को पानी में भिगोना चाहिए। 'ब्लाइट' रोग के नियंत्रण के लिए बुआई के 60 दिनों और 90 दिनों बाद डाइथेन एम 45 (0.2%) का दो बार छिड़काव करना चाहिए। माहू के आक्रमण को रोकने के लिए 0.03% डाइमेथोएट या 0.02% फासफोमिडोन का छिड़काव करना चाहिए। चूर्णीय फंफूँदी को रोकने के लिए 0.2% आर्द्र सल्फर का छिड़काव करें और नियमित रूप से सिंचाई करें।

### मेंथी (*ट्रिगोनेल्ला फोनम ग्रेसम*)

राजस्थान और गुजरात में नवंबर के प्रथम सप्ताह में बुआई करें। खेतों को तीन या चार बार अच्छी जोतकर तैयार करना चाहिए। अंतिम बुआई के बाद 10-15 टन गोबर की खाद या कम्पोस्ट मिलाना चाहिए और आधारीय खुराक के रूप में 20 कि. ग्राम नत्रजन, 40 कि. ग्राम फासफोरस और 20 कि. ग्राम पोटेश आदि उर्वरकों का प्रयोग भी करना चाहिए। बुआई मशीन या डिब्लर से बुआई करें। 15-20 कि. ग्राम प्रति हेक्टर की दर से बीज बोना चाहिए। चूर्णीय फंफूँदी को रोकने के लिए फूल लगने के समय हर 15 दिनों के बाद 20 कि. ग्राम प्रति हेक्टेयर की दर से सल्फर चूर्ण का प्रयोग करना चाहिए। पत्तियाँ खानेवाली सूँडियों और फल काटनेवाले कीटों की रोकथाम के लिए 0.05% क्विनालफोस छिड़कना चाहिए।

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## FARM OPERATIONS FOR ARECANUT AND SPICES FROM OCTOBER TO DECEMBER, 2020

### ARECANUT (*Areca catechu*)

#### Nursery

During the period of October- November

- \* Weeding and supervision for any pest and disease incidence.
- \* Watering depends on intensity of rain.
- \* Selection of mother palm, bunches, harvesting seed nuts and sowing in primary nursery, either nursery bed or poly bags.

Seed nuts are sown 5 cm apart in sand beds of 1.5 m width and convenient length with their stalk end pointing upwards. Fill potting mixture (2:1:1 soil: FYM: sand) in poly bags of 6"x9" size, 250 gauge with drain holes. Big size poly bags can also be used if seedlings are to be kept for more months in the nursery. Thick mulching is to be done with straw or areca leaves. Beds are to be watered daily either by using hose/sprinklers/misting.

During December month sowing is to be continued in primary nursery, either on nursery bed or poly bags. Shade net covering may be done in the nursery. Weeding, daily watering to be followed in the nursery garden.

#### Young garden

- \* Soil bunding and anchoring the young seedlings.
- \* Forking and fertilizer application (second dose if not applied during September).
- \* Incorporate the green manures grown as cover crops.

- \* Installation of drip lines and tubes.
- \* Irrigation once in a week.
- \* Shading with Coconut/Arecanut leaves.
- \* Mulching may be done in young areca plantations with areca leaves.

#### Old garden

##### Plant protection

- \* Scything and weeding as and when required.
- \* Forking and ploughing of interspaces in monocropped gardens may be practiced.
- \* If not applied in September, apply manures and fertilizers.
- \* Incorporate the green manures grown as cover crops.

Application of fertilizers and manures may be completed by October. Apply fertilizers to supply 50 gm Nitrogen (N), 20 gm Phosphorous ( $P_2O_5$ ) and 70 gm Potash ( $K_2O$ ) for ordinary varieties and for Mangala and other high yielding varieties apply 75 gm(N) 30 gm ( $P_2O_5$ ) and 105 gm ( $K_2O$ ) per palm. Cattle manure/compost and green leaf @ 12 kg per palm may also be applied in basins of 15 to 20 cm deep at a radius of 75 cm to 1 metre from the base of the palm. In low lying areas to cover the roots, fresh earth may be applied on exposed portions.

Irrigation of areca gardens and nursery may be started on receding of monsoon showers. Clean the irrigation channels and

commence irrigation once in a week at the rate of 175 liters of water per application. In gardens where there is shortage of water, drip irrigation may be adopted. Fertigation should be started from this month onwards up to completion of summer. In the west coast, where major area of Arecanut gardens are irrigated, watering the garden may commence once in seven or eight days during November-December.

Palms exposed to south western sun may require protection against sun-scorch and consequent stem breaking. In such cases green portions of the stem may be covered with areca leaf sheaths or opaque polythene film.

Orange coloured mites can be controlled by spraying the bunches with Dimethoate at 0.05 %. The same can be repeated after 45 days if it is severe.

Control spindle bug. In order to check the incidence of spindle bug attack, spray crowns with carbaryl 50 WP. The spray should reach the leaf axils. Repeat spraying after 30-35 days if pest incidence continues. For root grub control, provide proper drainage. Loosen soil around the base of palms to a depth of 10-15cm and drench with chlorpyrifos 0.04 per cent suspension twice, one in May just before the onset of southwest monsoon and again in September- October towards the end of the monsoon.

Harvesting for tender nut may be completed and for dry nut (chali) may be started. Rope harvest of seed nuts is recommended from the trees that are very tall and in places where the ground is hard.

## Spices:

### Pepper (*Piper nigrum*)

Tying the growing vines to the standard, providing shade to young vines etc. are to be done regularly to avoid trailing of vines on the ground. Removal of unwanted shoot growth and hanging shoots in older plants is recommended. Slash weeding to be undertaken. Digging may be done in the entire garden leaving an area of one metre around the base of the vine to avoid damage to the root system. Inspect and remove plants showing symptoms of phyllody and stunt disease (viral).

Pepper vines with desirable characters may be marked for collection of runner shoots for multiplication. Select mother plants of only varieties which are proven to be highly productive. Select a mother plant of the age group of 5-12 year, which give regular high yields and is relatively free from diseases including viral diseases. The selected runner shoots are coiled and raised on a stake to prevent from striking roots in the soil.

The second round of spraying against insect 'Pollu' using Dimethoate or Quinalphos (2 ml per litre of water) may be carried out in the first fortnight of October. Spray quinalphos (0.05%) during June-July and September-October or quinalphos (0.05%) during July and Neemgold (0.6%) (neem-based insecticide) during August, September and October is effective for the management of the pest. The underside of leaves (where adults are generally seen) and spikes are to be sprayed thoroughly. Spraying Dithane Z-78 or Zineb @ 2 gm per litre will take care of the crop against fungal pollu. If monsoon is prolonged, drench the basins of the vines with Potassium phosphonate 3 ml/litre @ 2-5 litre per vine, depending on the size of the vine. Root mealybug infestations can be controlled by drenching with chlorpyrifos

0.075%. In case of infestation of scale insects are noticed, spray neem oil 0.3% or neem gold 0.3% on affected vines, repeat spraying after 15 days in case the infestation persists. In case of infestation is severe, clip off severely infested branches and spray dimethoate 0.1%, repeat after 21 days. If berries are available on the vine the spray has to be given only after harvest of berries.

Harvesting may commence in the plains. Pepper berries separated from the spike may be dipped in boiling water for one minute in a perforated container and dried in the sun to improve the quality of black pepper.

### **Ginger and Turmeric (*Zingiber officinale* & *Curcuma longa*)**

Against incidence of shoot borers, spray 0.05 % Dimethoate or apply any granular insecticides in the soil. If leaf spot disease is noticed spray Dithane M-45 at 0.2 % concentration or 1 % Bordeaux mixture.

Water stagnation should be avoided by providing sufficient drainage. Identify disease free beds and leave them for full maturity to meet the requirement of seed rhizomes.

Final round of weeding and earthing up may be taken up to hasten the formation of bold rhizomes.

Ginger and Turmeric crops may be at the harvesting stage. The crops can be harvested when the leaves turn yellow and start drying up. After harvest, the fibrous roots attached to the rhizomes are trimmed off and soil is removed by washing.

### **Chillies (*Capsicum annum*)**

For the late sown winter season crop,

application of nitrogenous fertilizers, 45 days after planting may be carried out. Apply 20 to 25 kg N per hectare as top dressing. Weeding may be done if required. Plant protection operations may be necessary for mid-season crop sown in May-June. Spray Dimethoate 0.025 % at 15 days interval to control thrips. Against fruit borers, spray Quinalphos, 0.025 %. Spraying may be repeated as fortnightly intervals depending upon the intensity of pest incidence. To control fruit-rot and die-back, spray Dithane M 45 @ 2.5 gm or Bavistin @ 3 g per litre of water at 15 days interval.

### **Tree Spices**

Provide sufficient shade to newly planted seedlings and young plants. Mulching with green leaves at the bases after digging is desirable to conserve soil moisture. Spray Dimethoate at 0.05 % as a prophylactic measure against stem borers. Against the attack of scale and mealy bugs spray Dimethoate (Rogor) at 0.05 % concentration.

### **Seed Spices :**

#### **Coriander (*Coriandrum sativum*)**

Proper time for sowing is from the middle of October to middle of November. To hasten germination seeds may be soaked in water for six hours. About 15 tonnes of cattle manure may be applied as basal dose and 20 kg of Nitrogen (N) 30 kg of Phosphorous (P<sub>2</sub>O<sub>5</sub>) and 20 kg of Potash (K<sub>2</sub>O) are applied per hectare as fertilizers before sowing under unirrigated condition. Under irrigated condition Nitrogen (N) dose is increased to 50 kg, half of this quantity and whole of Phosphorous and Potash are applied as basal and

the remaining half of Nitrogen as top dressing. For pure crop a seed rate of 10 to 15 kg and for mixed 5 to 6 kg per hectare may be adopted. Treat seeds with suitable fungicide at the rate of 2 gm/kg of seed. Sowing may be done preferably through seed drills in rows of 25 cm apart. First irrigation is given immediately after the sowing.

To control powdery mildew disease, spray Wettable Sulphur 0.2 % once at flower initiation stage and another after 15 days. Dusting the crop with 20 to 25 kg Sulphur per hectare also controls the disease. To control aphids, 0.05 % Rogor may be sprayed.

#### **Cumin (*Cuminum cyminum*)**

Proper time for sowing is from mid November to first week of December. Cattle manure at the rate of 15 to 20 tonnes per hectare may be applied as basal dose. Fertilizers to supply 50 kg Nitrogen (N) and 20 kg Phosphorous ( $P_2 O_5$ ) may be applied per hectare. The optimum seed rate is 12 to 15 kg per hectare. The seeds may be treated with a suitable fungicide at the rate of 2 gm/kg of seeds before sowing. The seeds may be drilled at a spacing of 15 cm x 30 cm or broadcast. To control powdery mildew, Wettable Sulphur or Sulphur dust may be used. Against the attack of aphids, spray Phosphamidon or Dimethoate.

#### **Fennel (*Foeniculum vulgare*)**

Sowing time is from the middle of October to mid November. A fertilizer dose of 20 kg Nitrogen (N) and 30 kg Phosphorus ( $P_2 O_5$ ) may be applied per hectare besides 15 tonnes of cattle manure as basal application. Seed rate of 9 to 12 seeds per hectare may be adopted and sown in rows spaced at 40-60 cm apart. Soak the seeds in water prior to sowing to enhance germination. To control Blight disease, spray Dithane M-45 (0.2 %) twice, 60 days and 90 days after sowing. To control aphid attack, spray 0.03 % Dimethoate or 0.02 % Phosphomidon. Against powdery mildew, spray 0.2 % Wettable Sulphur. Frequent irrigations may be given.

#### **Fenugreek (*Trigonella foenumgraecum*)**

Sowing of seeds may be done in the first week of November for Rajasthan and Gujarat. The land is ploughed three to four times and made to a fine tilth. In the last ploughing 10-15 tonnes of cattle manure or compost is incorporated. Fertilizers to supply 20 kg Nitrogen (N), 40 kg Phosphorous ( $P_2 O_5$ ) and 20 kg Potash ( $K_2O$ ) are also applied as basal dose. The seeds are drilled or dibbled. A seed rate of 15-20 kg per hectare will be enough. Against powdery mildew, dust sulphur at the rate of 15 to 20 kg per hectare at the flowering stage and again 15 days later. To control leaf eating caterpillars and pod borers spray Quinalphos 0.05 %.

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## बाज़ार समीक्षा (अप्रैल-जून, 2020)

अप्रैल-जून, 2020 तिमाही के दौरान कोविड-19 महामारी के प्रसार को रोकने के लिए लॉक डाउन उपायों को लगाया गया था। इसलिए इस तिमाही में सीमित लेनदेन हुए। अप्रैल, 2020 में कड़े लॉक डाउन उपायों के कारण लेनदेन लगभग शून्य था।

### सुपारी

समीक्षाधीन तिमाही के दौरान कोची और चेन्नै बाज़ारों में सूखी सुपारी के मूल्य में स्थिरता का रुख दिखाई पड़ा और इसका मूल्य 19,300 रूपए प्रति क्विंटल पर स्थिर रहा। जून, 2020 के अंत की ओर मैंगलोर में सुपारी के मूल्य में सुधार हो गया। नई सुपारी का मूल्य जो मई के प्रथम सप्ताह में 19,500 रूपए प्रति क्विंटल था, वह जून, 2020 में 23,500 रूपए प्रति क्विंटल तक बढ़ गया।

### काली मिर्च

बाज़ारों में काली मिर्च के मूल्य में मिश्रित प्रवृत्ति दिखाई पड़ी। कोची बाज़ार में अनगारबल्ड काली मिर्च का भाव, जो अप्रैल, 2020 के प्रथम सप्ताहांत के दौरान 29,800 रूपए प्रति क्विंटल था, वह जून, 2020 के अंतिम सप्ताहांत के दौरान बढ़कर 31,500 रूपए प्रति क्विंटल हो गया। कोषिकोड बाज़ार में नाडन और वयनाडन काली मिर्च के भाव में मिश्रित प्रवृत्ति दिखाई पड़ी।

### अदरक

प्रायः सभी बाज़ारों में अदरक की कीमत में मिश्रित प्रवृत्ति दिखाई पड़ी। समीक्षाधीन अवधि के दौरान कोची में सूखे अदरक का दाम बिना किसी बदलाव के 27,000 रूपए प्रति क्विंटल

## MARKET REVIEW (APRIL TO JUNE, 2020)

Lockdown measures were imposed to contain the spread of Covid 19 pandemic during this period, April to June, 2020, hence limited transactions were taken place during this period. In the month of April, 2020 transactions were almost nil due to stringent lockdown measures.

### ARECANUT

Arecanut (dry) price has expressed an unvarying trend in Cochin and Chennai markets during the quarter under review and the price stood at Rs.19,300/quintal for the specified period. By the end of June, 2020, prices of Arecanut have improved in Mangalore market. The new supari, which was traded for a Rs. 19,500/quintal in the first week of May, had increased to Rs. 23,500/quintal during the month of June, 2020.

### BLACK PEPPER

Pepper market witnessed a mixed trend in prices. The price of ungarbled black pepper in Cochin market, which was Rs. 29,800/quintal during the first weekend of April, 2020, had increased to Rs. 31,500/quintal during the last weekend of June, 2020. In Kozhikode market, the prices of both Nadan and Wayanadan pepper showed a mixed trend.

### GINGER

Ginger prices displayed a mixed trend in almost all the markets. The price of dry ginger in Kochi market ruled at Rs. 27,000/quintal without any variations. In Chennai, dry ginger



पर स्थिर रहा। चेन्नै में जून के अंत में सूखे अदरक की कीमत में 2,500 रुपए प्रति क्विंटल की वृद्धि हुई। कोषिककोड में इसी अवधि के दौरान व्यापार रिपोर्ट नहीं की गई, जबकि ताजे अदरक की कीमत में गिरावट हुई।

### मिर्च

समीक्षाधीन अवधि के दौरान टूटिकोरिन बाजार में मिर्च के मूल्य में उतार की प्रवृत्ति देखी गई। इसी अवधि के दौरान चेन्नै में सम्बा-II किस्म के मूल्य में मिश्रित प्रवृत्ति और रामनाड किस्म के मूल्य में उतार की प्रवृत्ति देखी गई।

### हल्दी

समीक्षाधीन अवधि के दौरान कोची बाजार में हल्दी की कीमत में मजबूती का रुख देखा गया और इसकी कीमत 11,000 रुपए प्रति क्विंटल पर दर्ज की गई। तिमाही अंत के दौरान चेन्नै बाजार में ईरोड एवं सेलम हल्दी के भाव में वृद्धि की प्रवृत्ति देखी गई।

### लहसुन

समीक्षाधीन अवधि के दौरान बेंगलुरु बाजार में लहसुन के भाव में उतार की प्रवृत्ति दिखाई पड़ी और 1,300 रुपए प्रति क्विंटल की गिरावट दर्ज की गई।

### बीजीय मसाले

जीरा के दाम में वृद्धि की प्रवृत्ति देखी गई और धनिया में गिरावट हुई। बेंगलुरु बाजार में धनिया की कीमत 10,500 से 7,950 रुपए प्रति क्विंटल तक घट गई और जीरा का भाव 19,000 से 20,500 रुपए प्रति क्विंटल बढ़ गया।

### जायफल/जावित्री और लौंग

समीक्षाधीन अवधि के दौरान (छिल्का सहित और छिल्का रहित) जायफल के दाम में

prices increased by Rs. 2,500/quintal by the end of June. In Kozhikode, no transaction was reported from dry ginger, while the price of fresh ginger showed a descending trend.

### CHILLY

Chilli prices showed a downward trend in Tuticorin market and registered a decline of Rs. 2,500/ quintal. In Chennai, the price of Samba-II variety showed a mixed trend and that of Ramnad variety showed a decreasing trend during the same period.

### TURMERIC

In Cochin market, turmeric prices have shown firm trend and ruled at Rs.11,000/ quintal during April to June, 2020. In Chennai market, the price of both Erode and Salem turmeric have shown an increasing trend.

### GARLIC

Garlic prices in Bangalore showed a decreasing trend and recorded a decline of Rs. 1,300/quintal during the period under review.

### SEED SPICES

The price of cumin showed an increasing trend and that of coriander displayed a decreasing trend. The price of coriander decreased from Rs. 10,500/quintal to Rs. 7,950/ quintal in Bangalore market and that of cumin increased from Rs. 19,000 a quintal to Rs. 20,500/quintal.

### NUTMEG, MACE & CLOVES

The price of Nutmeg (both with shell and without shell) and mace showed a

उतार की प्रवृत्ति देखी गई। लौंग के भाव में उतार-चढ़ाव की प्रवृत्ति दिखाई पड़ी।

भारत तथा विदेश के प्रमुख बाज़ार केन्द्रों में सुपारी और मसाले के साप्ताहिक थोक भाव नीचे तालिका में दिया गया है।

decreasing trend during the period under review. Price of cloves showed a fluctuating trend.

Week-end wholesale prices of arecanut and spices recorded in the major market centers of India are appended in the following tables.

### WEEKLY WHOLESALE PRICES OF ARECANUT

KERALA

(Rs./quintal)

Month	Week	Kochi Dry	Thalassery New	Kozhikode Dry (Old)
Apr-20	1 <sup>st</sup>	19300	NT	NT
	2 <sup>nd</sup>	19300		
	3 <sup>rd</sup>	19300		
	4 <sup>th</sup>	19300		
May-20	1 <sup>st</sup>	19300	NT	23000
	2 <sup>nd</sup>	19300		23000
	3 <sup>rd</sup>	19300	24000	23500
	4 <sup>th</sup>	19300	24000	24500
	5 <sup>th</sup>	19300		
Jun-20	1 <sup>st</sup>	19300	26000	25500
	2 <sup>nd</sup>	19300	26000	25500
	3 <sup>rd</sup>	19300	27000	27500
	4 <sup>th</sup>	19300	29000	27000

Source : District Economics and Statistics Office, Ernakulam; Regional Statistical Office, Kozhikode.

**KARNATAKA, TAMIL NADU & GOA**

(Rs./quintal)

Month	Week	Mangalore		Chennai	Goa
		Choll Supari	New Supari	Rashi	Chali (Old)
Apr-20	1 <sup>st</sup>	NT		22500	NT
	2 <sup>nd</sup>			22500	
	3 <sup>rd</sup>			22500	
	4 <sup>th</sup>	25000	19500	22500	
May-20	1 <sup>st</sup>	25000	19500	22500	NT
	2 <sup>nd</sup>	25000	19500	22500	27200
	3 <sup>rd</sup>	27000	23500	22500	27200
	4 <sup>th</sup>	25000	19500	22500	27200
	5 <sup>th</sup>	NA			NA
Jun-20	1 <sup>st</sup>	27000	23500	22500	27200
	2 <sup>nd</sup>	27000	23500	22500	27200
	3 <sup>rd</sup>	27000	23500	22500	27200
	4 <sup>th</sup>	27000	23500	22500	28000

Source: Agricultural Produce & Marketing Committees (APMC), Mangalore, Economics & Statistics, Chennai, Directorate of Marketing, Goa.

**WEEKLY WHOLESALE PRICES OF BLACK PEPPER (Rs./Quintal)**

Month	Week	Kochi Ungarbled	Kozhikode		Kottayam
			Nadan	Wayanadan	
Apr-20	1 <sup>st</sup>	29800	NT		31000
	2 <sup>nd</sup>	29800			31000
	3 <sup>rd</sup>	29800			31000
	4 <sup>th</sup>	31300			31000
May-20	1 <sup>st</sup>	31200	NT		33000
	2 <sup>nd</sup>	31000			33000
	3 <sup>rd</sup>	30700	29000	32000	33000
	4 <sup>th</sup>	30500	29000	32000	36000
	5 <sup>th</sup>	30700	NT		35000
Jun-20	1 <sup>st</sup>	31500	29000	32000	36000
	2 <sup>nd</sup>	31500	30000	32000	33000
	3 <sup>rd</sup>	31500	30000	32000	34000
	4 <sup>th</sup>	31500	29000	31000	32000

Source: District Economics & Statistics, Ernakulam & Kottayam, Regional Statistical Office, Kozhikode .

**WEEKLY WHOLESALE PRICES OF GINGER (DRY) (Rs./Quintal)**

Month	Week	Kozhikode		Kochi Dry	Chennai Dry (white)	Bangalore Fresh
		Dry	Fresh			
Apr-20	1 <sup>st</sup>	NA	8000	27000	32000	NA
	2 <sup>nd</sup>		6500	27000	33000	3400
	3 <sup>rd</sup>		6000	27000	34000	3550
	4 <sup>th</sup>		5000	27000	34000	4150
May-20	1 <sup>st</sup>		5000	27000	34500	4700
	2 <sup>nd</sup>		4500	27000	34500	3900
	3 <sup>rd</sup>		4300	27000	34500	5100
	4 <sup>th</sup>		4300	27000	34500	5050
	5 <sup>th</sup>		4200	27000	34500	4500
Jun-20	1 <sup>st</sup>		6000	27000	34500	4550
	2 <sup>nd</sup>		6000	27000	34500	3700
	3 <sup>rd</sup>		6000	27000	34500	NA
	4 <sup>th</sup>		5800	27000	34500	

Source: Regional Statistical Office, Kozhikode; Economics & Statistics, Ernakulam; Department of Economics and Statistics, Chennai, APMC, Bangalore.

**WEEKLY WHOLESALE PRICES OF CHILLI (Rs./Quintal)**

Month	Week	Tuticorin Samba - I	Bangalore	Chennai	
				Ramnad	Samba-II
Apr-20	1 <sup>st</sup>	13500	14750	15500	12500
	2 <sup>nd</sup>	13500	13000	16500	13500
	3 <sup>rd</sup>	13500	13000	16500	14500
	4 <sup>th</sup>	13500	13000	16500	14500
May-20	1 <sup>st</sup>	13000	13000	16500	15000
	2 <sup>nd</sup>	13000	13000	16500	15000
	3 <sup>rd</sup>	13000	13000	16500	15000
	4 <sup>th</sup>	12500	13000	16500	14500
	5 <sup>th</sup>	12000	15250	16500	14500
Jun-20	1 <sup>st</sup>	12000	16500	16500	14000
	2 <sup>nd</sup>	12000	16500	16500	13500
	3 <sup>rd</sup>	11000	25000	17500	13500
	4 <sup>th</sup>	11000	25000	17500	12500

Source: Directorate of Marketing, Tuticorin; APMC, Bangalore; Dept. of Economics and Statistics, Chennai.

<b>WEEKLY WHOLESALE PRICES OF TURMERIC</b>					<b>(Rs./Quintal)</b>
<b>Month</b>	<b>Week</b>	<b>Chennai</b>		<b>Kochi</b>	<b>Bangalore</b>
		<b>Erode</b>	<b>Salem</b>	<b>Dry</b>	
Apr-20	1 <sup>st</sup>	10000	11500	11000	8500
	2 <sup>nd</sup>	10000	12500	11000	8500
	3 <sup>rd</sup>	10000	12000	11000	8500
	4 <sup>th</sup>	10000	12000	11000	8750
May-20	1 <sup>st</sup>	11000	12000	11000	9150
	2 <sup>nd</sup>	11000	12000	11000	9150
	3 <sup>rd</sup>	11000	12000	11000	9250
	4 <sup>th</sup>	11000	12000	11000	9250
	5 <sup>th</sup>	11000	12000	11000	9250
Jun-20	1 <sup>st</sup>	11000	12000	11000	9000
	2 <sup>nd</sup>	11000	12000	11000	9000
	3 <sup>rd</sup>	11000	12000	11000	9250
	4 <sup>th</sup>	11000	12000	11000	9250

Source: Dept. of Economics and Statistics, Chennai; Economics and Statistics, Kochi; APMC, Bangalore.

**WEEKLY WHOLESALE PRICES OF MAJOR SEED SPICES & GARLIC (Rs./Quintal)**

<b>Month</b>	<b>Week</b>	<b>Coriander</b>	<b>Cumin</b>	<b>Garlic</b>
		Rajasthan Green <b>Bangalore</b>	No.1 <b>Chennai</b>	Medium <b>Bangalore</b>
Apr-20	1 <sup>st</sup>	10500	19000	11000
	2 <sup>nd</sup>	10500	19000	11000
	3 <sup>rd</sup>	10500	19000	10750
	4 <sup>th</sup>	11000	19000	12000
May-20	1 <sup>st</sup>	11400	19000	9000
	2 <sup>nd</sup>	11400	19500	9750
	3 <sup>rd</sup>	11400	19500	8500
	4 <sup>th</sup>	9500	19500	9250
	5 <sup>th</sup>	8500	19500	9500
Jun-20	1 <sup>st</sup>	8400	19500	9450
	2 <sup>nd</sup>	8000	20500	8000
	3 <sup>rd</sup>	7950	20500	9500
	4 <sup>th</sup>	7950	20500	9700

Source: APMC, Bangalore & Dept. of Economics & Statistics, Chennai.

**WEEKLY WHOLESALE PRICES OF NUTMEG & CLOVE (Rs./Quintal)**

Month	Week	Thrissur			
		Nutmeg		Mace	Clove
		with shell	without Shell	Yellow	
Apr-20	1 <sup>st</sup>	29000	49000	200000	62000
	2 <sup>nd</sup>	28000	48000	200000	61000
	3 <sup>rd</sup>	28000	48000	200000	63000
	4 <sup>th</sup>	28000	48000	195000	62000
	5 <sup>th</sup>	27000	48000	195000	63000
May-20	1 <sup>st</sup>	24000	45000	150000	60000
	2 <sup>nd</sup>	24000	43000	160000	61000
	3 <sup>rd</sup>	25500	43000	150000	60000
	4 <sup>th</sup>	25500	42000	140000	62000
	5 <sup>th</sup>	NA	NA	NA	NA
Jun-20	1 <sup>st</sup>	25500	43000	140000	61000
	2 <sup>nd</sup>	26000	43000	140000	62000
	3 <sup>rd</sup>	26000	43000	150000	63000
	4 <sup>th</sup>	26000	42000	150000	62000

Source: Economics and Statistics, Thrissur.

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# Tender Coconut Water



## Undiluted, Unpolluted, Unpoisoned drink

Tender coconut water is the world's safest natural soft drink. It is considered the best for its many properties that cools the body and also builds immunity.

Tender Coconut Water - the sports drink rich in potassium and other vital minerals also contains traces of vitamins B group & vitamin C.



## नारियल विकास बोर्ड

(कृषि मंत्रालय, भारत सरकार)

## COCONUT DEVELOPMENT BOARD

(Ministry of Agriculture, Government of India)

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# FOR EVERY FIRST IN LIFE



**CAMPCO CHOCOLATE**

The Campco Chocolate are manufactured from selected good quality natural Indian made coca bean, carefully processed to the rich cocoa aroma and blend with fine quality milk solids and carbohydrates to a homogenous mass creating the finest texture and mellow taste resulting in a nutritious premium product.



The CAMPCO Ltd, Mission street, Mangaluru