

INDIAN REGULATORY SYSTEM OF SPICES VARIETAL TESTING, RELEASE AND NOTIFICATION: ISSUES AND STRATEGIES

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Spices are high value and low volume commodities of commerce in the world market. All over the world, the fast growing food industry depends largely on spices as taste and flavour makers. Health conscious consumers in developed countries prefer natural colours and flavours of plant origin to cheap synthetic ones. Thus, spices are the basic building blocks of flavour in food preparations. The estimated growth rate for spices demand in the world is around 3.19%, which is just above the population growth rate. Developing new innovative spices varieties for commercial release that open new markets is essential to build a stronger Indian Spice sector. Researchers are working to develop new spice cultivars with desirable production traits and industrial use that will help to recapture the domestic market and revitalize the industry. In India, new improved varieties of spices are developed by ICAR-IISR and AICRPS (All India Co-ordinated Research Project on Spices) involving State Agricultural Universities.

Regulatory system

Before a variety can be released by the Central Sub-Committee they are required to follow an established procedure of testing the

new variety for its Value for Cultivation and Use (VCU) by the All India Coordinated Research Project on Spices and identification of the variety for releases by the AICRPS workshop.

Each variety has to pass through three phases of evaluation.

1. Breeders contribute their best entries on the basis of evaluation carried out in their local programmes for testing in the Preliminary Yield Trial (PYT). These trials are organized in selected number of AICRPS centres and also tested for quality attributes, screened against important pests and diseases.
2. Qualifying entries from yield, disease and quality point of view in PYT are further tested in the Coordinated Varietal Trials (CVT). AICRPS conducts the trials under its supervision at experimental centers of ICAR Research Institutes and State Agricultural Universities.
3. A Special Committee of multi-disciplinary scientists is constituted at the AICRPS annual workshop to consider the proposals for identification of the varieties for release.

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Variety release and notification

Identification of superior genotypes by Plant Breeder can benefit the public only if it is offered for commercial multiplication. It is therefore, necessary to maintain a system where quantities of promising genotype are made available for commercial production. This process is referred to as release of the varieties. The purpose of release system is to introduce newly evolved varieties to the public for general cultivation in the regions in which it is suitable.

The practice of official release of varieties started in October, 1964 with the formation of the Central Variety Release Committee (CVRC) at the Central level and State Variety Release Committee (SARC) at State level. CVRC functioned up to November, 1969 then its functions were taken over by the Central Seed Committee (CSC) established under Seeds Act, 1966. The CSC constituted a Central Sub-committee on Crop Standards, Notification and Release of Varieties (CSC on CS, N&RV). The sub-committee discharges the functions of release and notification of varieties at Central level, while State Seed Sub-Committees (SSSCs) discharge similar function at State level. CSC and its Sub-committee have due representation for all the agencies involved in seed research, production and quality control namely State Governments, SCAs, SAUs, ICAR Institutes, Seed producing agency in public and private sector and seed farmers.

Notification of varieties after official release (at State as well as Central levels):

The varieties are notified under the Seeds Act so that the quality of seeds can be regulated.

The main purpose of notification is to bring the seeds of a particular crop/variety under the purview of Seed Law Enforcement, mainly to empower the Seed Inspectors to verify the quality of its seeds by sampling and analysis. The notification is made by the Central Government on the recommendation of the Central Seed Committee. The proposals for notification of State varieties are forwarded in the prescribed format by the State government after its release in that State to the Central Seed Committee for consideration.

Release Vs notification

The variety release is not a statutory function. Its main purpose is to declare the details of the newly evolved variety to the public. The variety notification is a statutory function performed under the Seeds Act so that the provisions of the Seeds Act could be applied to regulate the quality of seeds during sale.

Advantages of notification

- * Under the Seeds Act, certified seeds can be produced only of notified varieties and thus, notification precedes the certification. Therefore, notification is compulsory for production of certified seeds.
- * Seed Law Enforcement agency notified under the Seeds Act can draw and test samples of seeds of notified varieties to regulate the quality of seeds.
- * As specified under the Seeds Act, seeds of notified varieties can be sold after proper labeling and packing indicating the minimum specified standards.
- * Once the variety is notified, in general, it becomes Government of India asset.

The morphological characters of notified varieties are documented by the Central Seed Committee so as to curtail the bio-piracy.

- * The notification of the varieties will help to trace out its genesis.
- * Subsidies and other governmental programmes are being considered based on the notification status.
- * The varietal notification under Seed Act shall be valid for a period of 15 years in case of annual and biennial crops and 18 years for long duration perennial crops.

Once a variety has been released, its seed multiplication is subjected to rigorous seed certification standards, involving field inspections and laboratory testing, before certified seed can be made available to farmers.

In addition, the marketing of the seed of cultivars, and dissemination to farmers, is controlled by legislation and government policies. The regulatory framework aims to keep a large proportion of seed production in the hands of the public sector, so that the supply of quality seed is assured to farmers.

Notified varieties in major spices:

The variety which performs in many states/regions will be treated as 'notified variety', which has been evolved either by ICAR Institute, State Agricultural University, individual or organization. The sponsoring authority intended to release the variety should furnish the relevant information in the prescribed proforma and submit to the Subcommittee of varietal release and notification for consideration and notification of variety.

Notified varieties in major spices:

Crop	Variety	Year	Salient features	Recommended region
Black pepper	Pournami	1997	High yielding variety, tolerant to root knot nematode.	Recommended for cultivation in pepper growing areas of South India, especially where it is grown as an inter-crop for its high tolerance to root knot nematode.
	Panniyur 9	2017	Long spikes, medium berries and suitable for hilly tracts	Kerala, Karnataka and Andhra Pradesh
Cardamom	Appangala 1	1999	Early maturing, suitable for high density planting, long panicle	Recommended for release and cultivation in the small cardamom growing areas of Karnataka and Kerala.
	Appangala 2	2017	Tolerant to Katte mosaic virus, high yielding	Karnataka and Kerala
	IISR Avinash	2018	Tolerant to rhizome rot, high yielding, dark green colour capsules	Karnataka and Kerala

Crop	Variety	Year	Salient features	Recommended region
Ginger	Mohini	2018	High yielding, bold rhizomes.	Kerala, Odisha, Himachal Pradesh and West Bengal
	Suprabha	2018	Plumpy rhizome, less fibre, wide adaptability, suitable for both early and late sowing.	Odisha, Karnataka, Madhya Pradesh and Andhra Pradesh
	Suruchi	2018	Profuse tillering, bold rhizome, early maturing, suitable for both rainfed and irrigated condition.	Odisha, Karnataka, Madhya Pradesh and Andhra Pradesh
	Suravi	2018	Plumpy rhizome, dark skinned yellow fleshed, suitable for both irrigated and rainfed conditions.	Odisha, Karnataka, Madhya Pradesh and Andhra Pradesh
Turmeric	IISR Pragati	2017	Short duration, high curcumin and nematode tolerant variety	Kerala, Tamil Nadu, Andhra Pradesh, Telanagana, Karnataka, and Chhattisgarh
	Surama	2018	Round and plumpy rhizome, field tolerance to leaf blotch, leaf spot and rhizome scales.	Odisha, Andhra Pradesh, Telangana, Madhya Pradesh, Maharashtra and Chhattisgarh
	Roma	2018	Suitable for both rainfed and irrigated condition. Ideal for hilly areas and late sown season.	Odisha, Andhra Pradesh, Telangana, Madhya Pradesh, Maharashtra and Chhattisgarh
	Rashmi	2018	Bold rhizomes, suitable for both rainfed and irrigated condition, early and late sown season	Odisha, Andhra Pradesh, Telangana, Madhya Pradesh, Maharashtra and Chhattisgarh
Nutmeg	IISR Keralashree	2019	Bold nut with thick and entire mace, wide adaptability	Kerala and Tamil Nadu

Notified state varieties:

The cultivar which performs only in one State will be treated as 'State variety', which has been evolved either by ICAR institute, State Agricultural University, individual or organization. Such varieties have to be

considered by the State Seed Sub-committee of that particular State for release. The sponsoring authority intended to release the variety should furnish the relevant information in the prescribed proforma and submit to the Sub-committee of varietal release and notification for consideration and notification of variety.

Notified state varieties:

Crop	Variety	Year	Salient features	Recommended region
Black pepper	Panniyur 6	-	Steady and stable yielder. Suitable for open condition as well as partial shade	Kerala
	Panniyur 7	-	Vigorous, hardy and a regular bearer, long spike, high piperine (5.6%), suitable open and shaded conditions.	Kerala
Cardamom	ICRI 8	2015	Ovoid bold, pale green capsules, high yielding	Karnataka
Large Cardamom	ICRI Sikkim 1	2002	Selection from Sawney, well adapted	Sikkim
	ICRI Sikkim 2	2002	Selection from Sawney, well adapted	Sikkim
Ginger	Suruchi	1988	Profuse tillering, bold rhizome, early maturing, suitable for both rainfed and irrigated condition.	Odisha
	Suprabha	1988	Plumpy rhizome, less fibre, wide adaptability, suitable for both early and late sowing.	Odisha
Turmeric	Surama	1988	Round and plumpy rhizome, field tolerance to leaf blotch, leaf spot and rhizome scales.	Odisha
	Roma	1988	Suitable for both rainfed and irrigated condition. Ideal for hilly areas and late sown season.	Odisha
	Rashmi	1988	Bold rhizomes, suitable for both rainfed and irrigated condition, early and late sown season	Odisha
	Ranga	1988	Bold and spindle shaped mother rhizome, suitable for late sown condition and low lying areas.	Odisha

Crop	Variety	Year	Salient features	Recommended region
	Pant Peetabh Megha	2001		Uttar Pradesh
	Turmeric	2001	High curcumin content and bold rhizomes	Meghalaya
	Sona	2005	Orange yellow rhizome, medium bold with low tertiary fingers	Kerala
	Varna	2005	Bright orange yellow rhizome, medium bold with closer internodes, tertiary fingers present.	Kerala
	Phule Swarupa	2006	High curcumin content, clonal selection of Duggriala	Maharashtra
	Punjab Haladi 1	2014	Plant height medium and long, medium thick rhizomes. Rhizome colour dark yellow.	Punjab
	Punjab Haladi 2	2014	Plant height tall, rhizomes with yellow colour.	Punjab
	Co 2	2016	High curcumin, duration 250-260 days	Tamil Nadu
	GNT 2	2017	High yielding, Curcumin content 4.1%	Gujarat
	Gujarat Turmeric 1	2019	High yielding	Gujarat
	Uttarrupanjana	2019	Bold rhizomes, moderately resistant to leaf spot and leaf blotch diseases.	West Bengal
Nutmeg	Konkan Sughandha	1998	Tree canopy is conical and compact.	Maharashtra
	Konkan Swad	2006	Canopy erect, conical shape. Contain 39.85% essential oil in seed and 10.9 % in mace.	Maharashtra
Kokum	Konkan Amruta	1997	Early type, requires minimum number of plucking, long shelf life of fruits	Maharashtra
Cinnamon	Sugandhini	2000	Tree medium size, eugenol content 94% in leaves	Kerala
Tamarind	Dharwad Tamarind Selection 1	1995	Sweet red type	Karnataka
	Dharwad Tamarind Selection 2	1995	High yield potential and early bearing	Karnataka

Issues and strategies for spices varieties:

The Indian spices improvement programme is backed up by a strong crop improvement programme in both the ICAR and SAUs. The seed regulatory system in major spices, mostly vegetatively propagated, receive relatively little attention from development-oriented research and commercial seed sector actors, despite their importance. Seed systems in spices involve breeders, farmers, communities, researchers, and governance regimes and operate at different scales. The systems have agro-ecological, socio-economic and political contexts; as such they are also affected by larger global developments such as climate change, globalization of economies and demographic developments.

(i) Problems in varietal development

Breeding new cultivars in spices were mainly undertaken through clonal selection, few possibilities of genetic recombination by sexual reproduction followed by many generations of selection and vegetative propagation. Some of the perennial spice crops *viz.*, black pepper, cardamom, cinnamon, nutmeg, garcinia and clove take a minimum of 15-20 years for development of a variety due to the long gestation period. The research organizations working on such spices are also limited as compared to other horticultural crops. A suitable shorter varietal development system for such perennial spices need to be developed.

(ii) Vegetative multiplication

The vegetative propagation in spices through the use of grafts/budded plants (nutmeg), stems (black pepper), rhizomes (ginger, turmeric), or suckers (cardamom) results in many differences which also affect the resulting seed

systems. First, vegetative multiplication means that they can be multiplied 'true to type', *i.e.* their genotype is fixed. Secondly, vegetative propagation makes them vulnerable to the build-up of viruses and other pathogens. Third, their bulkiness, low multiplication rate and perishability have implications for their storability and transportation. The resulting seed systems are therefore quite distinct from other annual crops and characterised by being farmer and trader dominated, only partially commoditised, dependent on public sector R&D efforts and less formally regulated. Because of these differences, there is less attractiveness for the private sector to engage in spices seed systems.

(iii) Nursery accreditation system

Establishment of a network of spice nursery to ensure the availability of good quality, disease free, certified planting material of desired high yielding varieties will have a tremendous impact on production, productivity and quality of the spices produced. This is particularly so in perennial spice crops which have a long gestation period and its production potential is revealed only in later stages. The Department of Agriculture, Cooperation and Farmers Welfare (DAC & FW), Government of India, has entrusted the Directorate of Arecanut and Spices Development (DASD) to put in place a nursery recognition regime for Spices so that a network of recognized model nursery is established across the nation which could function as a reliable source of supply of quality planting materials for spice crops.

(iv) Targeted deployment of varieties

The adoption of improved varieties varies

greatly among different spice crops, states and regions. Also, most of the major spices being perennial, adoption of improved varieties of all crops in India is low and shows that access and diffusion of the improved varieties are a general concern. Hence concerted efforts are required from governmental agencies to multiply the identified varieties for large scale distribution and targeted varietal deployment.

The outbreak and rapid spread of diseases affecting spice crops, such as virus pandemics affecting black pepper and cardamom in Kerala and Karnataka are aggravated by the vegetative character of the planting material. Spread of new diseases, including viruses, contribute to farmers' interest in accessing resistant varieties or clean planting material where resistance is unavailable. These pressures on important spice crops emphasize the relevance of a well-developed public or private seed supply of improved varieties.

In spices, the quality aspects being the most important traits, the quality characters are highly influenced by environment and hence region specific varietal deployment should be adopted.

(v) Development of seed certification standards

Seed quality has four dimensions: physiological (germination, vigour), genetic (varietal purity, adaptation), phyto-sanitary (absence of diseases) and physical seed batch characteristics (percentage of good seeds, free of stones and weed seed). The loss of quality of any of these four aspects from continuous propagation is called degeneration and can result in yield reduction.

The General Seed Certification Standards are applicable to all crops which are eligible for certification, and with field and seed standards for the individual crops, shall constitute the Minimum Seed Certification Standards. The word 'Seed' or 'seeds' as used in these standards shall include all propagating materials. The seed certification standards of tree spices are presently not available. These standards are need to be developed first and then only varieties are eligible for notification.

(vi) Notification of released varieties

Large number of varieties have been released in spices through National Agricultural Research System in India. However, most of the varieties are not notified as per provisions of Seed Act, 1966 which hinders inclusion of such varieties in developmental programmes. Hence, concerted efforts are required from research organizations in notification of all the released varieties.

(vii) Encouragement of state government participation in seed production

Failure of State Department to multiply the Foundation seed, limited land and infrastructure for breeder seed production, limited area for production of quality seed are some of the issues which hinders participation of state governments and private players in spices seed certification system.

(viii) Benefit sharing

Clonal selection played the most significant role in developing several high yielding varieties in spices. The selection was mainly applied on land races collected from different growing areas of the country. The issue of benefit sharing

in case of commercialization of the released varieties arising out of germplasm collections from farmer's field needs to be debated and regularized. The ownership issues pertaining to the initial varieties, breeding materials, germplasm, landraces, farmer varieties, genes, events, processes used in the development of a variety/hybrid has to be critically examined.

(ix) Varietal authentication

The taxonomic characters used to ascertain varietal identity and purity are called DUS (Distinctness, Uniformity and Stability) characteristics, and have been assessed during the registration of the new variety according to national and international legislation and protocols. The authenticity of cultivars is a topic of great economic importance especially when the crop is lucrative, cultivation is expanding, quality principles are genotype dependent, and there is growing interest among farmers for quality high yielding planting material. It has been proposed that molecular testing may be a way to make variety registration and certification more efficient and cost effective. Molecular methods combined with appropriate sampling strategies have the potential to determine whether a variety is distinct from other varieties of the same species, and whether it is uniform and stable through propagation.

(x) Potato seed system: A model to be followed

Extensive research has been conducted on potato in industrial countries, accompanied by public policies and regulations designed to advance formal commercial seed systems for the crop. Even though the potato seed system can hardly be said to be mature in most

developing countries, there is an extensive body of knowledge globally that can be drawn on.

(xi) Non-exclusive varietal license system of ICAR

The most effective seed system in spices is to create effective and efficient smallholder or farmer seed enterprises with lower capital investment needs and reduced overheads. These enterprises, often made up of farmer organizations, are often close to smallholder farmers and located in farming communities, and should be able to distribute quality seeds of improved varieties of major spices effectively and efficiently. They are vital in linking the formal and informal seed sectors.

ICAR plant varieties are commercialized in a manner that their quality seed is available to farmers of respective areas of varietal adaptability through local/regional multiplication and sales. To achieve this, ICAR will grant non-exclusive licences to all interested licensees from private, public or non-governmental sectors or the farmers' cooperative that may have capabilities for quality seed production and distribution/sale. The commercialization approach will be compatible with the PPV&FR Act/Seeds Act/Biodiversity Act. It will be made obligatory on the part of all licensees that they use the variety denomination registered by ICAR under the PPV&FR Act. They will also be obliged to maintain the seed quality/purity; and use ICAR collective mark/trademark on seed packets/bags. The ICAR-IISR turmeric varieties licensed through non-exclusive licensing system to few potential farmer entrepreneurs is working well in Andhra Pradesh and Telangana.

Conclusion:

Quality planting material is a key component among all inputs for sustainable spices production. It is estimated that quality of seed/planting material accounts for 20-25% of productivity. The quality planting material should be made available to the farmers in time and in sufficient quantity at reasonable prices. The public sector research and development institutions involved in varietal development and seed multiplication in spices needs to be strengthened so as to provide good quality seeds to the farmers at reasonable cost. Seed laws are to be channelized to ensure supply of quality planting materials. The collaboration of both public and private sector may obviously help in quality planting material production in India. An improved understanding of farmers' motivations to use (or not use) quality planting material from formal sector sources is one step

towards better designed interventions for the improvement of spices crops and seed systems.

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