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**Ashoka N**
University of Horticultural Sciences, Bagalkot, Karnataka, India

**Mangala KP**
University of Horticultural Sciences, Bagalkot, Karnataka, India

**Dhanraj P**
University of Horticultural Sciences, Bagalkot, Karnataka, India

**Ravi Kumar B**
University of Horticultural Sciences, Bagalkot, Karnataka, India

**Annapurna Neeralgi**
University of Horticultural Sciences, Bagalkot, Karnataka, India

**Ravi Y**
ICAR-National Research Centre on Seed Spice, Ajmer, Rajasthan, India

**Corresponding Author:**
**Ravi Y**
ICAR-National Research Centre on Seed Spice, Ajmer, Rajasthan, India

# *Sigandhini* indigenous landrace of black pepper (*Piper nigrum* L.): The resilient savior of India's spice heritage

**Ashoka N, Mangala KP, Dhanraj P, Ravi Kumar B, Annapurna Neeralgi and Ravi Y**

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**Abstract**
India, often hailed as the "Spice Bowl of the World," has a rich history intertwined with the cultivation and trade of exotic spices. The arrival of the British in India was largely driven by the allure of these spices, with black pepper reigning as the "King of Spices." For centuries, the Western Ghats region has been a primary hub for black pepper cultivation. However, changing climate patterns and other factors have brought new challenges, particularly for the ruling variety, Panniyur-1, which is susceptible to quick wilt disease, leading to reduced yields and increased prices. Amidst this crisis, a remarkable farmer, Mr. Ramakantha Hegde, and his ancestors from Siddapura Taluk in Uttara Kannada, have conserved an age-old black pepper variety called *Sigandhini*, renowned for its resistance against wilt diseases and its high bulk seed density. With the support of scientists Mr. Ramakantha Hegde secured "Farmer's Rights" for *Sigandhini* under the Protection of Plant Varieties and Farmers' Rights Act (PPVFRA). This right grants him the authority to propagate and sell *Sigandhini* plants across India. In recognition of his outstanding contribution to conserving this heritage variety, Mr. Ramakantha Hegde was recently honoured with the prestigious Plant Genome Savior Award by the Honorable President of India. Today, *Sigandhini* is gaining popularity among farmers, not only in its traditional cultivation areas but also in non-traditional regions. Farmers are increasingly choosing *Sigandhini* as a resilient alternative to combat wilt diseases while sustaining the rich legacy of Indian spices. To meet the growing demand for *Sigandhini* plants, Mr. Hegde has entered into a Memorandum of Understanding (MOU) with the University of Horticultural Sciences, Bagalkot, on a royalty basis. This partnership ensures the wider availability of *Sigandhini* plants, promoting its adoption and securing a more resilient future for black pepper cultivation in India.

**Keywords:** Black pepper, *Sigandhini*, wilt resistance, farmer-led conservation, PPVFRA

## Introduction
India, often heralded as the "Spice Bowl of the World," boasts a profound historical tapestry woven with the cultivation and trade of exotic spices. Among the myriad treasures that have captivated nations and driven exploration, black pepper stands tall as the undisputed "King of Spices." The allure of these aromatic wonders beckoned the British to India, shaping the course of history and establishing the nation as a global spice powerhouse. For centuries, the Western Ghats region has stood as a bastion of black pepper cultivation, nurturing the growth of varieties that have become synonymous with India's spice legacy (Ashoka *et al*., 2023) [3].

Following the introduction of Panniyur-1 in 1966-67, a hybrid derived from *Uthirankotta* and *Cheriyakaniakkadan* developed by Kerala Agricultural University at Panniyur (Kerala), farmers widely embraced this high-yielding hybrid. Unfortunately, this extensive adoption inadvertently led to the disappearance of numerous locally diverse cultivars from various regions in Karnataka. The widespread cultivation of a single variety heightened the susceptibility to epidemics (Naik *et al*., 2013) [7]; increased risks associated with pest and disease outbreaks, and posed threats of entire crop loss due to various stresses such as drought, flood, and heavy rainfall. Amidst this scenario, some black pepper growers demonstrated heightened awareness in conserving and promoting local and traditional varieties, resulting in the preservation of several hundred valuable cultivars. Notable examples include Ademane, Keregadde Mallisara, Kurimale, Boppanalli Chomala, Basari Balli, Somali, among others. Among these preserved cultivars is *Sigandhini*, standing as a testament to the efforts aimed at safeguarding the diversity

of black pepper varieties (Shankarprasad *et al*., 2021) [9].

Yet, as with any saga of agriculture, the narrative of black pepper cultivation is not immune to the evolving dynamics of climate and other factors. The prevailing champion, Panniyur-1, grapples with a formidable adversary—quick wilt disease (Lydia and Gangadhara, 2017; Shivakumar *et al*., 2022) [10]. This formidable foe has cast a shadow over the once-thriving yields, ushering in an era of reduced productivity and escalating prices. To address the challenge, nowadays, farmers are opting for costlier plants that have been grafted with Brazilian pepper (Mohan, 2018) [6]. In the face of this agricultural crisis, a beacon of hope emerges from the quaint Siddapura Taluk in Uttara Kannada, where a visionary farmer, Mr. Ramakantha Hegde, and his ancestors have diligently conserved an age-old black pepper variety named *Sigandhini*.

*Sigandhini*, renowned for its resilience against wilt diseases and distinguished by its high bulk seed density, embodies a legacy that transcends generations. This variety, carefully safeguarded by Mr. Hegde's stewardship, has become a symbol of agricultural heritage and a testament to the intrinsic connection between farmers and their crops. Under the protective canopy of the Protection of Plant Varieties and Farmers' Rights Act (PPVFRA), Mr. Hegde secured "Farmer's Rights" for *Sigandhini*, bestowing upon him the authority to propagate and distribute its plants across the diverse landscapes of India.

The recognition of Mr. Ramakantha Hegde's outstanding contribution to conserving this heritage variety reached its zenith when he was honored with the prestigious Plant Genome Savior Award by the Honourable President of India in 2023. This accolade not only acknowledges the individual efforts but also underscores the collective significance of preserving agricultural biodiversity and traditional wisdom. In the mosaic of India's horticultural narrative, Mr. Hegde's story stands as a shining example of sustainable agricultural practices intertwined with cultural heritage.

Today, *Sigandhini* is experiencing resurgence, gaining popularity not only in its traditional cultivation areas but also in non-traditional regions. Farmers, faced with the dual challenge of climate uncertainties and the need for resilient crop varieties, are increasingly turning to *Sigandhini* as a steadfast alternative. "In doing so, they not only secure their livelihoods but also contribute to the conservation of India's rich legacy of spices, aligning seamlessly with the testament of 'Vocal for Local' etho of the Government of India (Anonymous, 2023) [1].

To address the burgeoning demand for *Sigandhini* plants and facilitate its widespread adoption, Mr. Hegde has entered into a strategic Memorandum of Understanding (MOU) with the esteemed University of Horticultural Sciences, Bagalkot. This collaboration, rooted in a royalty-sharing basis, ensures the broader availability of *Sigandhini* plants. As the tendrils of this partnership spread, the adoption of *Sigandhini* promises to usher in a more resilient future for black pepper cultivation in India.

As one can embark on this research journey, delving into the intricacies of *Sigandhini* and its transformative impact on black pepper cultivation, researcher traverses the realms of agricultural history, biodiversity conservation, and sustainable horticultural practices. The tale of *Sigandhini* is a testament to the harmonious coexistence of tradition and innovation, a narrative that resonates in the very soil of India's spice-laden landscapes. In this context, the study was undertaken with the following aims:

1. To record the advantages of *Sigandhini* compared to Panniyur-1.
2. To examine farmers' perceptions of the *Sigandhini* landrace.
3. To identify the limitations associated with the *Sigandhini* landrace.

## Materials and Methods

This study relies on a blend of primary and secondary data obtained from diverse sources. In the year 2023, primary data were gathered from black pepper agripreneurs through a pre-designed interview schedule, encompassing aspects such as perceptions, reasons, and limitations related to the *Sigandhini* landrace, along with other relevant information. Concurrently, secondary data were sourced from various outlets.

The choice of Uttara Kannada district for this research was deliberate, given its status as a significant producer of both black pepper varieties within Karnataka's Western Ghats. Notably, this district holds the Intellectual Property Rights (IPR) under the Protection of Plant Varieties and Farmers' Rights Act (PPVFRA) for the *Sigandhini* variety. Employing a snowball sampling technique was deemed appropriate due to the recent adoption of this landrace by a limited number of entrepreneurs. Primary data collection involved interactions with 50 entrepreneurs. The analytical and interpretative aspects of the data were addressed through the application of descriptive statistics.

The snowball sampling technique, employed in this study, offers unique merits that align with its specific methodology. This approach is particularly advantageous when investigating niche or emerging phenomena, as it enables the identification and inclusion of participants who may be challenging to reach through traditional sampling methods. In the context of studying the adoption of the *Sigandhini* landrace by black pepper agripreneurs, the snowball sampling technique proves valuable in capturing insights from a select group of entrepreneurs who have recently embraced this agricultural practice. This method facilitates a deeper exploration of perceptions, reasons, and limitations associated with the *Sigandhini* landrace, providing a nuanced understanding of the subject within a relatively limited pool of adopters.

## Results and Discussion

*Sigandhini* landraces of Black pepper are locally adapted, traditional variety that has evolved over time through natural selection and farmer-driven selection processes. The merits of a particular landrace would depend on its specific characteristics, adaptability to local conditions, flavour profile, disease resistance, and other agronomic traits.

### Perception of plantation owners on Panniyur-I

The perception of Black pepper plantation owners regarding ruling Panniyur-1 and *Sigandhini* is essential to draw the attention of policy makers and same has been depicted in Fig. 1. Eighty four per cent owners of Panniyur-I plantations expressed the view that the crop has become increasingly vulnerable to quick wilt (foot rot) disease, primarily attributed to the presence of *Phytophthora capsici* in recent years. This susceptibility is linked to alterations in rainfall patterns, shifts in climate (specifically relative humidity), aeration challenges, and a diminished exposure to sunlight resulting from the adoption of a multi-storeyed high-density cropping system over the past decade. A consensus among Eighty per cent highlighted the elevated cost of plants grafted Panniyur-I with Brazilian pepper (*Piper collubrinum*). Similarly, a majority (76%) of owners identified the challenge of procuring quinine Panniyur-I plants from private nurseries. Sixty eight per cent agripreneurs conveyed concerns about significant yield reduction (5-10%) caused by the destructive foot rot disease, emphasizing the

crop's susceptibility. Additionally, fifty two per cent farmers noted that the bulk density of Panniyur-I (546 g/l) is lower compared to *Sigandhini*, leading to decreased yields.

**Reasons for preferring *Sigandhini* for cultivation**

In response to these challenges, a subset of farmers has transitioned to cultivating *Sigandhini* Black pepper, characterized as a local landrace. This study also aimed to ascertain the reasons behind the preference for *Sigandhini* over the predominant Panniyur-I variety (Fig. 2).

Nintey four per cent farmers have chosen to cultivate *Sigandhini* due to its status as a local landrace, marked by its adaptation to the specific regional conditions. This adaptability encompasses the ability to withstand higher rainfall levels and various biotic and abiotic stresses. Notably, the *Sigandhini* landrace is well-suited for intercropping with Arecanut, a predominant economic crop in the region, as expressed by ninety per cent farmers.

Eighty two per cent proprietors opted for *Sigandhini* due to its early maturity, facilitating harvest by December each year and allowing ample time for post-harvest handling. Similar findings were also documented by Hussain *et al*. (2017) [5]. Additionally, eighty per cent farmers cited *Sigandhini*'s resilience against foot rot disease, a significant advantage over the susceptible Panniyur-I. The preference for *Sigandhini* was further driven by seventy eighty per cent respondents who emphasized its higher yield (10%), attributed to resistance against foot rot, greater bulk density (631 g/l), and longer spike length (14.06 cm) —traits rooted in its genetic characteristics, as noted by 39 farmers. These results are supported by Divya *et al*. (2023).

**Limitations of *Sigandhini* traditional land-race**

Inherent in the natural order, every organism exhibits both advantages and disadvantages. This research endeavour sought to comprehensively document the drawbacks associated with *Sigandhini*, with the aim of bringing attention to policymakers (Fig. 3). Ninety per cent respondents underscored the non-availability of *Sigandhini* plants, a circumstance arising from the exclusive right of propagation vested in Mr. Ramakant Hegde as a result of "Farmer's Right" conferred by PPVFRA, New Delhi. Consequently, no other entities are permitted to propagate and market *Sigandhini* plants.

The monopoly nature of this seedling business was acknowledged by seventy eight per cent respondents, who noted that *Sigandhini* plants were marketed at elevated prices. The resulting high cost was attributed to the monopoly prevailing in the sector. Transportation challenges were identified by seventy six respondents, given the need for sophisticated transportation facilities due to the premium pricing of the plants. Moreover, fifty per cent farmers highlighted the seasonal nature of nursery raising or propagation activities, emphasizing that such activities are more prevalent during the summer season for optimal success. Ashoka *et al*., (2021) [2] documented comparable findings regarding the *Sigandhini* landrace.

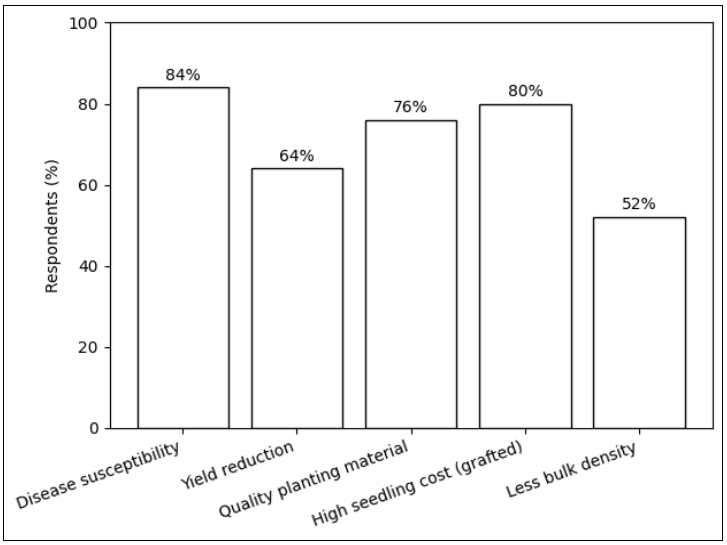


**Fig 1:** Perception of Panniyur-I plantation owners

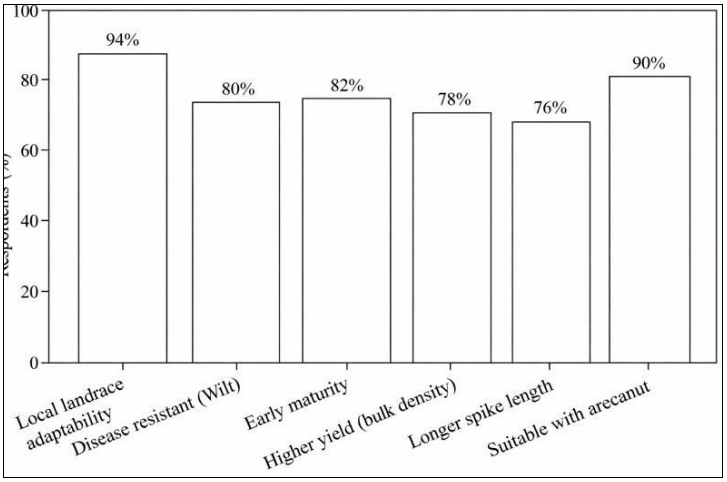


**Fig 2:** Reason for preferring *Sigandhini*

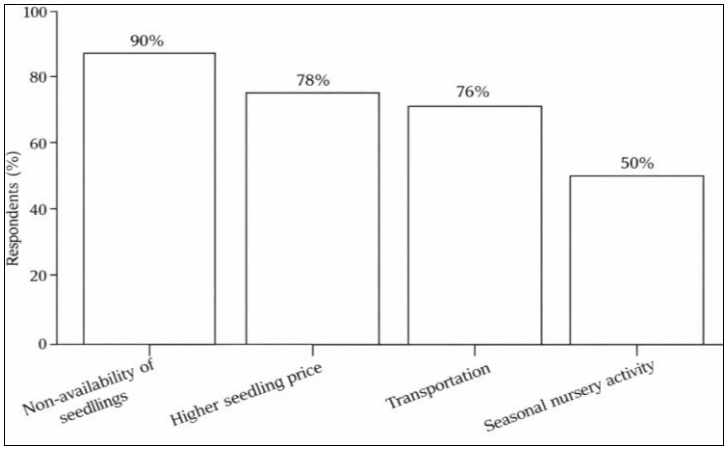


**Fig 3:** Limitations of *Sigandhini* landrace

## Conclusion

In conclusion, this research has provided a comprehensive exploration of the cultivation dynamics of *Sigandhini* Black pepper, shedding light on both its merits and demerits. The advantages, including adaptability to regional conditions, resistance to foot rot, and higher yield, position *Sigandhini* as a viable alternative for farmers facing challenges with the predominant Panniyur-I variety. However, the study also highlights critical drawbacks, notably the restricted availability of *Sigandhini* plants due to exclusive propagation rights, resulting in inflated prices and transportation difficulties.

Policy implications arising from these findings are paramount for sustainable agricultural practices. Policymakers should consider revisiting the regulatory framework governing the proprietary rights of landraces, such as *Sigandhini*, to promote fair access to plants and prevent monopolistic practices. Addressing the seasonal nature of nursery activities and exploring measures to enhance availability during critical periods, like summer, could contribute to more robust and consistent cultivation practices. Furthermore, initiatives fostering research and development to overcome the identified challenges, such as developing disease-resistant varieties or facilitating broader seedling distribution networks, can significantly benefit the agricultural community. Encouraging diversified cropping systems, particularly intercropping with economically significant crops like Arecanut, may further enhance the overall resilience of agricultural practices in the region. To expedite the propagation and distribution of *Sigandhini* plants, the Horticulture Department, Government of Karnataka may establish a MOU with Mr. Ramakant Hegde, incorporating a royalty-sharing arrangement. In essence, a thoughtful integration of these policy considerations can pave the way for a more sustainable, equitable, and resilient agricultural landscape, ensuring the prosperity of farmers and the longevity of alternative crops like *Sigandhini* Black pepper.

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