



P-ISSN: 2349-8528  
 E-ISSN: 2321-4902  
 IJCS 2019; 7(6): 2930-2932  
 © 2019 IJCS  
 Received: 21-09-2019  
 Accepted: 25-10-2019

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## International Journal of Chemical Studies

### Source of valuable genes for augmenting breeding in black pepper (*Piper nigrum* L.)

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#### Abstract

Black pepper is cultivated in the tropical regions of the world. Favourable climatic conditions and motivated growers have made Madikeri, Karnataka a hub of black pepper plantation in the country. Large plantations on assorted standards harbouring rich diversity of the black pepper primary gene pool make the tract a gold mine for black pepper breeders. Surveys were conducted in Madikeri black pepper plantations to collect black pepper germplasm. A total of 31 accessions among which 4 unique genotypes having long spike up to 30 cm, Trimonoecious flowers, sweet type/low pungency and Vadakkan (triploid) with elongated leaves were collected. The collected materials are conserved at National Active Germplasm site (NAGs) for black pepper, ICAR-Indian Institute of Spices Research (IISR), experimental farm, Kozhikode and maintained under good conditions after rooting. The materials will be planted in field gene bank for evaluation and utilization.

**Keywords:** Germplasm collection, conservation, Long spike, Trimonoecious, Pungency

#### Introduction

Black pepper (*Piper nigrum* L.) with the sobriquets 'black gold' or 'King of spices' is native to tropical evergreen forests of Western Ghats (Rahiman *et al.*, 1979) [3]. Geographically, *P. nigrum* is mostly cultivated in hot and moist conditions (Ravindran and Kallapurackal 2012) [4]. The primary areas of the black pepper cultivation are in the Western Ghats of the South Indian Peninsula, subsequently was introduced to other countries in South and Southeast Asia (Hao *et al.* 2012) [1]. Primary and secondary gene pools constitute the bulk of diversity in black pepper Cultivar diversity in black pepper the main component of primary gene pool, is contributed by improved varieties, landraces, self-grown progenies and in few cases the natural mutants (Sasikumar *et al.* 2007) [7]. Though on the one hand genetic erosion due to the spread of high yielding varieties and rampant destruction of the natural habitat is a fact in this spice, self-grown seedlings in black pepper plantations remain an untapped source of variation. This source of variation is now being recorded. The ICAR-Indian Institute of Spices Research (IISR), Kozhikode has the primary mandate of collection and conservation of the biological diversity of spices from all over the country. In this study, within the frame of a regional project devoted to the safeguard and management of local black pepper resources, germplasm survey/explorations were carried out to collect, characterize and conserve unique black pepper germplasm accessions from black pepper plantations in Madikeri/Coorg, Karnataka.

#### Material and Methods

An exploration was carried out during 2017-18 in selected black pepper plantations in Madikeri district of Karnataka, which is one of the major production hubs of black pepper (Fig 1). At each collection site a passport data sheet was filled using GPS system that included latitude, longitude and altitude of the place of collection. Data were collected through informed consent semi structured interviews on specific traits from the custodian of the germplasm samples. Each collection was assigned a unique collector number.

#### Results and Discussion

A total of thirty-one germplasm accessions were collected from different plantations among which 4 are of unique types (Table 1). The uniqueness of the accessions are detailed below:

**Table 1:** Unique germplasm collected.

Sl. No.	Collection number	Unique feature	Collection site	Geographical coordinates
1	8084	Long spike up to 30 cm	SLN plantation, Chettalli, Madikeri	12°21'70"N 75°50'95"E
2	8095	Trimonoecious	Sridevi estate, Near Irale valamudi, Madikeri	12°24'58"N 74°49'49"E
3	8093	Sweet type (Low pungency)	Ponnathmath estate, Attur Nallur, Madikeri	12°23'54"N 75°49'53"E
4	8089	Vadakkan with elongated leaf	Nagrane estate, Suntikoppa, Madikeri	12°45'26"N 75°82'94"E

**Fig 1:** Map showing the collection site of the germplasm accessions

### 1. Elongated spike

A black pepper genotype with very long spike (upto 30 cm in length), early maturity with good seed set was collected (Acc. No. 8084) (Fig 2). Spike length above 25cm is rather very rare in cultivated black pepper (Saji *et al.*, 2013) [6] and hence a unique line. This accession can be a source of valuable genes to improve spike length in black pepper which is the most important yield attributing character.

**Fig 2:** Accession No. 8084 having long spike

### 2. Trimonoecious accession

Cultivated black pepper is bisexual in general having both male and female flowers in same spike (Ravindran *et al.*, 2000) [5]. However from one of the estates a genotype which exhibited 3 types of sexuality i.e. male, female and hermaphrodite spikes in same vine (Acc. No. 8095) (Fig. 3) was collected. Such Trimonoecious entities are very unique

This will be a valuable material to study the sex expression and segregation in black pepper.

**Fig 3:** Accession No. 8095 having male, female and hermaphrodite spike

### 3. Sweet black pepper

A black pepper accession with sweet berries (less pungent) was also collected (Acc. No. 8093). Pungency in black pepper is a function of piperine, oleoresin and essential oil (Zachariah and Parthasarathy, 2008) [8]. This "sweet" type would be a good source for evolving sweet black pepper genotypes or for product diversification.

### 4. Variant of Vadakkan genotype

Black pepper genotype Vadakkan is a natural triploid with cordate leaves (Nair *et al.*, 1993) [2]. A variant of Vadakkan with large elongated leaves was also collected (Acc. No. 8089). This may be a self-generated seedling progeny of Vadakkan. The collected materials are conserved at National Active Germplasm site (NAGs) for black pepper, ICAR-IISR, experimental farm, Peruvannamuzhi, Kozhikode and maintained under good conditions after rooting. The materials will be planted in field gene bank for evaluation and utilization.

### Conclusion

Viable sexual reproduction in black pepper coupled with congenial conditions for seed germination in the big estates offers good scope for matured seeds fallen from spikes or disseminated by birds to germinate and thrive on the shade-tress/standards. Being heterozygous in nature, the vine throws out sergeants among the progenies. In order to locate such progenies, black pepper plantations in the main production tracts needs intensive surveys to locate and characterise such variants the present collections from Madikeri estates good source of valuable genes for augmenting breeding in black pepper are very.

### Acknowledgement

The authors place on record their sincere thanks to all the farmers and managers of estates for providing access to the

estate. We also acknowledge the help rendered by Mr. K. P. Ramachandran, Technical officer for assistance in conducting the germplasm collection programme and A Sudhakaran, artist-photographer, ICAR-IISR for the photographs.

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