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Data collection and documentation of genotype dependent variations in promising south Indian cultivated *solanum melongena* L.

Soumyamol N[1*], Sheeba M J[2], Sivu A R[1]
[1] Department of Botany, Mahatma Gandhi College Thiruvananthapuram, Kerala, India
[2] Department of Botany, T. K. M College of Arts and Science, Kollam, Kerala, India

Abstract
Solanum melongena L. is one of the most popular vegetable crop belonging to the family Solanaceae. In the present study an attempt has been made to examine how many local, released and hybrid varieties are being cultivated in South India from Kerala, Andra Pradesh, Andaman and Nicobar, Karnataka, Tamil Nadu, Lakshadweep, Pudhucherry and Telangana. Data collection method is used in the study for collecting data from cultivated genotypes of brinjal and to determine the similarities and differences in genotypic variations of the eggplant populations from different regions from Agricultural Universities, Agricultural Research Institute and Krishibhavan through the South Indian States. The results indicated that among the South Indian States Tamil Nadu, Kerala and Karnataka showed maximum cultivation of brinjal varieties. The data revealed that in Tamil Nadu twenty two released, seven local and nine hybrid varieties are now cultivated. The least cultivation was in Andaman and Nicobar. It should be concluded that, large scale cultivation of released, local and hybrid have taken in Tamil Nadu compared to other Southern regions of India. The present investigation indicated 27% of total cultivation from South India is from Tamil Nadu followed by Kerala (25%) then Karnataka (21%) and the least cultivation in Andaman and Nicobar (1%).

Keywords: *Solanum melongena* l, south India, genotypes, agronomic performance

Introduction
Solanum melongena L. (Eggplant) is one of the important and major vegetable crops in India and other parts of the world, belonging to the family Solanacea. The present study serves to analyse South Indian varieties of brinjal including local, released and hybrid genotypes from Kerala, Andra Pradesh, Andaman and Nicobar, Karnataka, Tamil Nadu, Lakshadweep, Pudhucherry and Telangana. The plant is erect, herbaceous and branched, flowers are bisexual, pentamerous and are solitary or 2-7 flowered cyme. Calyx is persistant. Corolla is lobed with different shape and purple, light pink or white coloured. Stamens are free in nature. Ovary is bilocular with many ovules. Fruit is berry with wide variation in shape, colour and size. Fruit shape varies in different varieties with long, oval, Round, ovoid, cylindrical or elongated. Fruit colour may be nearly black, different shades of purple, white, green or variegated.

In South India a large number of released varieties are reported. Improved varieties have better agronomic performances than local varieties and are suitable in climatic changes. Local varieties are adapted to open field cultivation, can be used for developing released and hybrid varities. Brinjal flowers are open pollinated in nature. So, it show genetic diversity and can be more adaptable to local growing conditions. Pest and disease resistant varieties with upright growth habit, high yield, fruits with soft flesh, low seedliness, lowsolanin content and attractive glossy skin are generally preferred for commercial cultivation. In the present study an attempt has been made to examine how many local, released and hybrid varieties are being cultivated in South India.

Materials and methods
In the present study data collection method is used for collecting data from South Indian cultivated genotypes of brinjal. The (Figure 1) indicates the South Indian States namely Kerala, Andhra Pradesh, Andaman and Nicobar, Karnataka, Tamil Nadu, Lakshadweep, Pudhucherry and Telangana. The aim of the work is to identify the cultivated genotypes in South Indian States. For this study data were collected from Agricultural Universities, Agricultural Research Institutes, Krishibhavan throughout the South Indian States. The work were completed by obtaining the data from internet agricultural bulletins and journals and periodicals. This study helped to identify the total released genotypes, total local genotypes and total hybrids from South India. Which is helpful to future reference and research purposes. Genotype dependent variation studies were carried out from these data and is presented in the form of table. The purpose of the study is find out the most commonly cultivated brinjal genotypes in South Indian region. For the morphological characters, the data collected for genotype dependent variation studies were number of fruits per plant, fruit length, fruit colour, plant height, petiole length, fruit weight, fruit shape, acceptability, fruit girth, fruit set percentage, floral characters and foliar characters. These morphological characters were very much useful for identifying the most popularly cultivated brinjal varieties in South India.

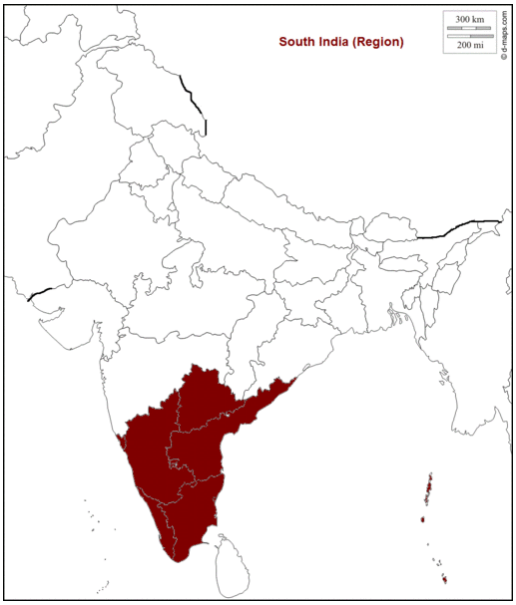

Fig 1: Map of India showing South Indian States

Results and Discussion

The present study indicates the data collected for genotype dependent variation studies of the released, local and hybrid brinjal genotypes from South Indian regions, which includes Kerala, Andra Pradesh, Andaman and Nicobar, Karnatka, Tamil Nadu, Lakshadweep, Pudhucherry and Telangana. The following (Table 1) shows the number of released, local and hybrid varieties that have been cultivated in each South Indian States. For the morphological characters, the data collected for genotype dependent variation studies were number of fruits per plant, fruit length, colour of fruit, fruit shape, floral and foliar features etc. The categorisation of morphological characters of brinjal (https://www.eagri.org) [1] has been followed in the present study. The above results have been discussed and reviewed by many leading scientists (Neetu *et al*., 2018) [2]. The (Figure 3) showed identification of most popularly cultivated brinjal varieties in South India. From the given (Figure 3) it should be concluded that, the highest cultivation stands for the released genotypes. Majority of released varieties have been made by Agricultural Universities, Agricultural Research Institutes etc. From the given (Figure 4) it should be showed that the highest cultivars of brinjal is in Tamil Nadu and lowest one is Andaman and Nicobar.

In Kerala, released, local and hybrid brinjal genotypes are cultivated. The brinjal varieties cultivate in Kerala are also cultivating in Andra Pradesh, Karnataka, Tamil Nadu and Telangana. Released genotypes of brinjal varieties cultivate in Kerala are also cultivating in Andra Pradesh, Karnataka, Tamil Nadu and Telangana. Released genotypes of brinjal includes Surya, Swetha, Haritha, Pant Samrat, Ponny, Pusa Kranti, Pusa Barsati, Manjiri Gota, Vaishali, Pusa Purple Long, Pusa Anupama, Arka Sheel, Arka Kusumakar, Arka Nidhi, PH-4, BR-112, Hisar Shyamal, Kashi Sandesh, Kashi Komal, Pusa Purple Cluster and PB-70 are cultivated in Kerala. Local types includes Varikathiri, Poiyur Purple, Ujala, Bhavani gold etc and hybrid varieties includes Neelima, Pusahybrid-5, Pusa hybrid-6, Arka Anand, Arka Navneeth, HABH-8 and COBH-1 are also cultivated in Kerala. Most among these varieties are released from Agricultural Universities. The (Figure 3) showed that, released varieties are cultivated in increased rate because, the climatic conditions over these regions are good enough for their cultivation, also brinjal can grown on any type of soil as well as majority genotypes are resistant to bacterial wilt diseases. From the evidences clear that, Surya, Swetha, Neelima, Ponnyetc are released from Kerala Agricultural University, which are highly resistant to bacterial wilt diseases (http://www.kau.in) [3].

In Andra Pradesh, huge amount of released varieties are cultivated and the same varieties can be cultivated in Kerala, Karnataka, Tamil Nadu and Telangana. Local and hybrid brinjal varieties also cultivated among Andra Pradesh regions. Cultivated released varieties are APAU-Gulabi, APAU-Bagyamathi, PB-70, IC-0598429, PH-4, BR-112, Hisar Shyamal, Kashi Sandesh, Kashi Komal, Pusa Purple Cluster, Gulabi (Sel-4) and Pant Samrat. From the (Figure 3) we can understand that local varieties are not cultivated in Andra Pradesh. Hybrid genotypes consists of Arka Anand and Arka Navneeth. According to Rao *et al.*, (2012) [4] observed that, the major challenge exists in the growth of brinjal varieties due to unstable climatic changes.

In Andaman and Nicobar CARI-B1 released genotypes has been cultivated in large scale (Table 1). Local and hybrid varieties are not cultivated recently.

In Karnataka, released, local and hybrid brinjal genotypes are cultivated. PB-70, Pusa Purple Long, Pusa Anupama, Arka Sheel, Arka kusumakar, Arka Shirish, Arka Nidhi, Arka Keshav, Arka Neelkanth, PH-4, BR-112, Hisar Shyamal, Kashi Sandesh, Kashi Komal, Pusa Purple Cluster, Gulabi (Sel-4), Pant Samrat are released genotypes cultivated in Karnataka. Cultivated local varieties are Nanthavana Kathiri, Ujala, Bhavani gold, Purple round, Brinjal white oblong round and varikathiri. Hybrid varieties are HABH-8, Pusa hybrid-5, Pusa hybrid-6, Arka Anand, Arka Navneeth, Azad Kranti. Released type varieties has been cultivated in highest rate (Figure 3). The same variety can be cultivated in Kerala, Andra Pradesh, Tamil Nadu and Telangana regions.

In Tamil Nadu, released, local and hybrid genotypes are cultivated. Here, the released types are cultivated in large scale. By observing the (Figure 3) it should be concluded that large scale cultivation of released, local and hybrid have taken place in Tamil Nadu when compared to other Southern regions of India. Released varieties includes, PB-70, Pusa Puple Long, Pusa Anupama, Arka Sheel, Arka Kusumakar, Arka Shirish, Arka Nidhi, CO-1, MDU-1, PKM-1, KKM-1, PPI-1, PLR(BR)2, TNAU Brinjal VRM1, Hisar Shyamal, Kashi Sandesh, Kashi Komal, Pusa Purple Cluster, PH-4, Pant Samrat, Annamalai, BR-112 etc. Local genotypes are cultivated in Tamil Nadu consists of Varikathiri, Poiyur Purple, Nanthavana Kathiri, Bhavani gold, Ujala, Purple round, Brinjal white oblong round. Hybrid types are COBH-1, HABH-8, Pusa hybrid-5, Pusa hybrid-6, Arka Anand, Arka Navneeth, COBH-2 etc. Released varieties are highly preferred in the markets of Tamil Nadu due to the variation of morphology and pollination of flowers. Same variety can be cultivated in Kerala, Andra Pradesh, Tamil Nadu and Telangana (Table 1). Agnieszka and Monika (2008) [5] concluded that, the yield of brinjal plants also depends on the flowering and climatic changes.

In Lakshadweep, only hybrid varieties are cultivated (Figure 3). It includes CO2, Arka Anand etc. CO2 variety is cultivated in large scale there is a high yielding variety. The

Sandy or calcareous soil of Lakshadweep enhances the growth of CO2 variety. Similar studies observed that, the significant yield improvement could be possible through the use of selected varieties with different organic nutrition and pest management practices. Coconut leaf vermi composting and vermi wash were found to be highly useful in increasing the yield of several vegetable crops under Island conditions (Crop production techniques of horticultural crops, 2013) [6].

In Pudhucherry, only released varieties are cultivated (Figure 3). PB-70, PH-4, BR-112, Hisar Shyamal, Kashi Sandesh, Kashi Komal, and Pusa Purple Cluster are common released genotypes of brinjal. Same variety can be cultivated in Kerala, Andra Pradesh, Karnataka and Tamil Nadu (Table 1).

In Telangana, both released and hybrid varieties are cultivated. Released varieties includes, Pusa Purple Long, Bhagyamathi, Green spiny, PH-4, BR-112, HisarShyamal, KashiSandesh, KashiKomal, Pusa Purple Cluster, Gulabi (Sel-4) and Pant Samrat. Arka Anand and ArkaSheel hybrid genotypes are cultivated in Telangana. Released genotypes are grown in large scale (Figure 3).

The present study reveals that, flower morphology is suited to produce more genotypes of released and hybrid brinjal varieties.

Table 1: south Indian genotypes of brinjal with their salient features

Sl No	Varieties			Conservation strategy	Distribution	Mean Morphological Identification
	Released	Local	Hybrid			
1	Surya			Cultivated	Kerala	Fruits medium sized, oval and glossy violet
2	Swetha			Cultivated	Kerala	Medium, long, white fruits
3	Haritha			Cultivated	Kerala	Light green, long fruits
4	Pant Samrat			Cultivated	Kerala, Andra Pradesh, Karnataka, Tamil Nadu, Pudhucherry, Telangana	Medium to long fruits with dark purple colour
5	Ponny			Cultivated	Kerala	Green coloured long fruits
6	Pusa Kranti			Cultivated	Kerala	Oblong fruits with dark purple colour
7	Pusa Barsati			Cultivated	Kerala	Fruits are medium long and purple
8	Manjiri Gota			Cultivated	Kerala	Fruits are medium-large, round and purple coloured with white stripes.
9	Vaishali			Cultivated	Kerala	Fruits are oval in shape and purple in colour with white stripes. The stalks of the fruit bear spines.
10		Unda vazhuthana		Cultivated	Kerala	fruits look like apple
11		Neenda vazhuthana		Cultivated	Kerala	Long, glossy fruits
12		Kottayam local		Cultivated	Kerala	Small sized, rounded fruits
13	Pusa Purple Long			Cultivated	Kerala, Karnataka, Tamil Nadu, Telangana	Long fruits with glossy and purple nature
14	Pusa anupama			Cultivated	Kerala, Karnataka, Tamil Nadu	Fruits are cylindrical, tender and purple
15	Arka Sheel			Cultivated	Kerala, Karnataka, Tamil Nadu	Medium sized fruits with deep shining purple skin
16	Arka kusumakar			Cultivated	Kerala, Karnataka, Tamil Nadu	fruits are green, small borne in clusters
17	Arka Nidhi			Cultivated	Kerala, Karnataka, Tamil Nadu	Purple fruits
18	PH-4			Cultivated	Kerala, Andra Pradesh, Karnataka, Tamil Nadu, Pudhucherry, Telangana	Fruits are medium to long and deep purple colour
19	BR-112			Cultivated	Kerala, Andra Pradesh, Karnataka, Tamil Nadu, Pudhucherry, Telangana	Round fruits with bright purple colour
20	Hisar shyamal			Cutivated	Kerala, Andra Pradesh, Karnataka, Tamil Nadu, Pudhucherry, Telangana	Round fruits with bright dark purple colour
21	Kashi Sandesh			Cultivated	Kerala, Andra Pradesh, Karnataka, Tamil Nadu, Pudhucherry, Telangana	Medium sized round fruits with purple colour
22	Kashi komal			Cultivated	Kerala, Andra Pradesh, Karnataka, Tamil Nadu, Pudhucherry, Telangana	Long, purple fruits, soft texture
23	Pusa Purple Cluster			Cultivated	Kerala, Andra Pradesh, Karnataka, Tamil Nadu, Pudhucherry, Telangana	Oblong fruits with less seeded, fruits are non-spiny
24	PB-70			Cultivated	Kerala, Andra Pradesh, Karnataka, Tamil Nadu, Pudhucherry	Small, round, green coloured fruits

25		Varikathiri		Cultivated	Kerala, Karnataka, Tamil Nadu,	Fruits are slightly oblong in nature, pale green colour with dark streaks
26		Poiyur purple		Cultivated	Kerala, Tamil Nadu	Purple, medium sized fruits with oblong shape
27		Ujala		Cultivated	Kerala, Karnataka, Tamil Nadu	Purple, oblong fruits
28		Bhavani gold		Cultivated	Kerala, Karnataka, Tamil Nadu	Purple, round fruits
29			Neelima	Cultivated	Kerala	Oval to round fruits with glossy violet nature
30			Pusa hybrid-5	Cultivated	Kerala, Karnataka, Tamil Nadu	Dark purple fruits with long, glossy apperance
31			Pusa hybrid-6	Cultivated	Kerala, Karnataka, Tamil Nadu	Fruits are glossy, round and purple colour
32			Arka Anand	Cultivated	Kerala, Andra Pradesh, Karnataka, Tamil Nadu, Lakshadweep, Telangana	Medium long fruits with green colour
33			Arka Navneeth	Cultivated	Kerala, Andra Pradesh, Karnataka, Tamil Nadu, Telangana	Purple, oblong fruits
34			HABH-8	Cultivated	Kerala, Karnataka, Tamil Nadu	Round fruits
35			COBH-1	Cultivated	Kerala, Tamil Nadu	Slightly oblong fruits with violet colour
36	APAU- Gulabi			Cultivated	Andra Pradesh	Oblong fruits with pale purple
37	APAU-Bagyamathi			Cultivated	Andra Pradesh	Oblong fruits with deep purple colour
38	IC-0598429			Cultivated	Andra Pradesh	Oval fruits and purple green in colour with white patches
39	Gulabi (Sel-4)			Cultivated	Andra Pradesh, Karnataka, Telangana	Medium long fruits with purple colour, fruits borne in clusters of 3-5
40	CARI-1 Brinjal			Cultivated	Andaman and Nicobar	Fruits are oblong with green colour
41	Arka shirish			Cultivated	Karnataka, Tamil Nadu	Extra long fruits with green colour
42	Arka Keshav			Cultivated	Karnataka	Red purple coloured fruits green leaves and purple leaf base
43	Arka Neelkanth			Cultivated	Karnataka	Fruits are tender in nature
44		Nanthavana kathiri		Cultivated	Karnataka, Tamil Nadu	Purple or light violet coloured fruits
45		Purple round		Cultivated	Karnataka	Purple, rounded fruits
46		Brinjal white oblong round		Cultivated	karnataka	White, oblong, round fruits
47			Azad Kranti	Cultivated	karnataka	Fruits are oblong with less seeded
48	CO-1			Cultivated	Tamil Nadu	Oblong,medium sized fruits with light green colour
49	MDU-1			Cultivated	Tamil Nadu	Fruits are round, bright purple
50	PKM-1			Cultivated	Tamil Nadu	Medium sized fruits
51			CO-2	Cultivated	Tamil Nadu, Lakshadweep	Oblong fruits with brown stripes
52	KKM-1			Cultivated	Tamil Nadu	Egg shaped fruits with milky white nature and borne on clusters
53			COBH-1	Cultivated	Tamil Nadu	Slightly oblong fruits with violet colour
54	PPI-1			Cultivated	Tamil Nadu	Pale green colour and oblong fruits
55	PLR(BR)2			Cultivated	Tamil Nadu	Oval fruits with dark purple and glossy nature
56	TNAU Brinjal VRM1			Cultivated	Tamil Nadu	Oval fruits with glossy pink appearance andgreen tinge at the distal end
57	Annamalai			Cultivated	Tamil Nadu	Oblong fruits, throns on calyx and purple colour
58			COBH-2	Cultivated	Tamil Nadu	Medium sized fruits with oblong in shape and dark violet colour
59			Pant rituraj	Cultivated	Tamil Nadu	Almost round shaped fruits with dark purple nature
60	Bhagyamathi			Cultivated	Telangana	Round shaped, violet coloured fruits
61	Green spiny			Cultivated	Telangana	Green coloured fruits

Fig 3: Brinjal varieties

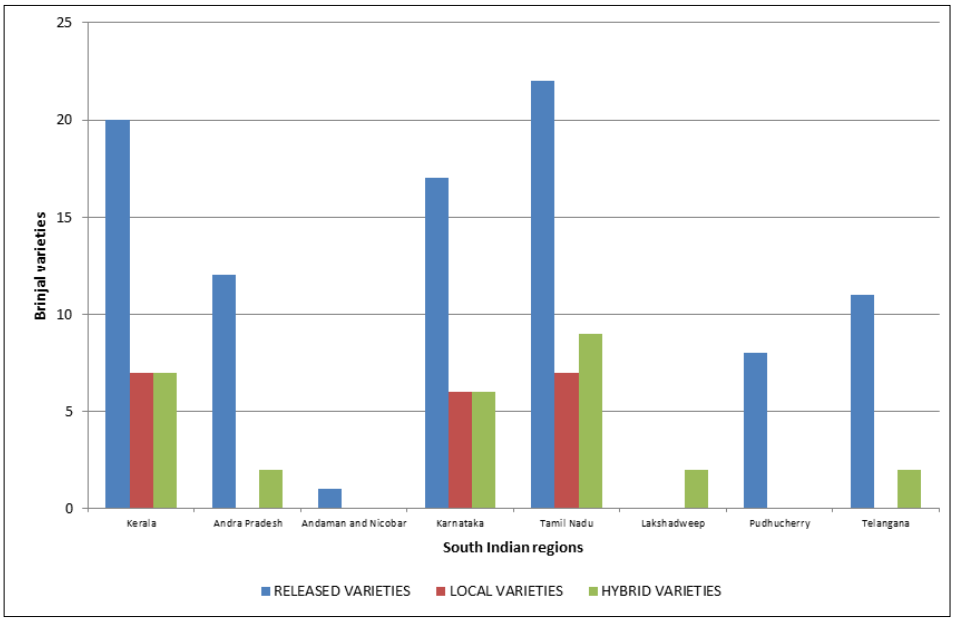

Fig 4: Total genotypes of brinjal in south India

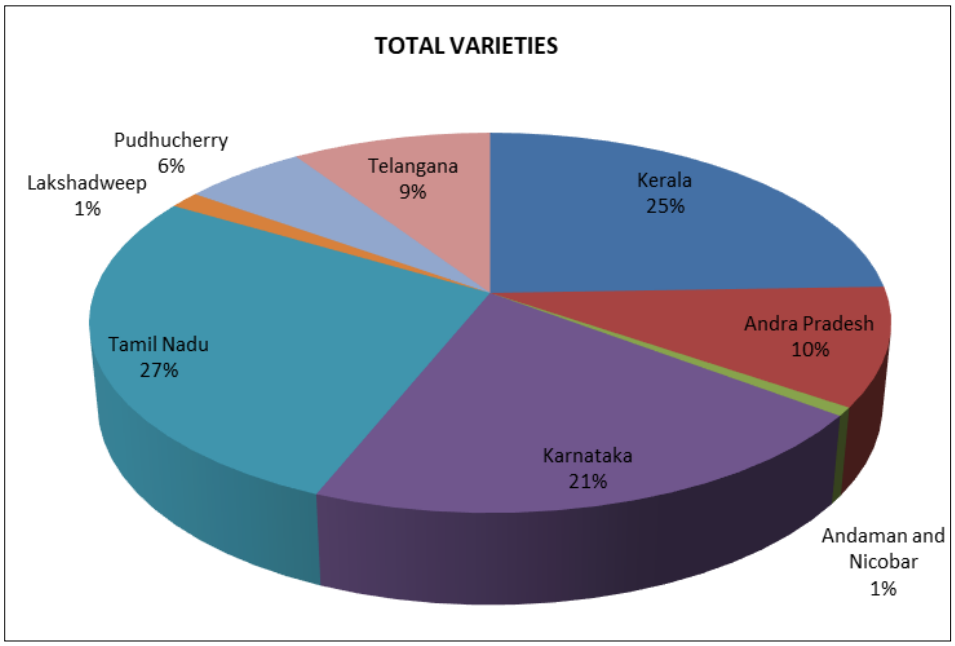

Fig 5: Total South Indian varieties of brinjal

Conclusions

Solanum melongena L. is one of the major vegetable crop belonging to the family Solanaceae. In the present study an attempt has been made to examine how many local, released and hybrid varieties are being cultivated in South India from Kerala, Andra Pradesh, Andaman and Nicobar, Karnataka, Tamil Nadu, Lakshadweep, Pudhucherry and Telangana. Data collection method is used in the study for collecting data from cultivated genotypes of brinjal and to determine the similarities and differences in genotypic variations of the eggplant populations from different regions from Agricultural Universities, Agricultural Research Institute and Krishibhavan through the South Indian States. The results indicated that among the South Indian States Tamil Nadu, Kerala and Karnataka showed maximum cultivation of brinjal varieties. The data revealed that in Tamil Nadu twenty two released, seven local and nine hybrid varieties are now cultivated. The least cultivation was in Andaman and Nicobar. It should be concluded that, large scale cultivation of released, local and hybrid have taken in Tamil Nadu compared to other southern regions of India. The present investigation indicated 27% of total cultivation from South India is from Tamil Nadu followed by Kerala (25%) then Karnataka (21%) and the least cultivation in Andaman and Nicobar (1%).

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