Collection of Diversity in Castor (*Ricinus communis* L.) Germplasm from Parts of Andhra Pradesh

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A crop specific exploration was conducted to collect diversity in castor *(Ricinus communis* L.) from different parts of Andhra Pradesh having a tradition of growing castor as sole crop, trap/shade crop and as backyard plant. A total of 122 accessions including landraces and primitive cultivars were collected. Variability was observed for different characters viz., bloom (waxy coating on aerial parts of plant), stem coluration, plant height and node numbers, nature and size of raceme, spike shape and compactness and type, size and dehiscence nature of capsules. Probable sources for resistance/tolerance to wilt, botrytis, sucking pests besides early maturing types, have been identified based on phenotypic characters. The collected germplasm with the wide diversity needs to be further characterized and evaluated for utilization in improvement programmes.

Key words: Castor, Diversity, Andhra Pradesh, Germplasm

Castor (*Ricinus communis* L.) is believed to be a native of Tropical Africa. India is considered as a secondary centre of diversity/origin of castor. It is an important oilseed crop of India. India is the largest producer (7.7 lakh tonnes.) and has a monopolis in the international castor oil trade (Hegde, 2002). The castor oil export brings a sizable amount of foreign exchange into the country for utility in paints, soaps, lubricants, detergents, printing inks, pharmaceuticals and cosmetic industries. It is mainly cultivated for seeds, which yield fast drying; non-yellowing oil upon dehydration used mainly in industry and medicines. Castor seeds contain 35-55 per cent of oil having 85-95 per cent ricinoleic acid.

The centre of origin of castor and Indo-Gangetic plains are the centres of variability (Kulkarni and Ramamurthy, 1977; Anjani *et al.*, 1999 and Duhoon *et al.*, 1996). The species is common throughout the country in all climates ranging from tropical, sub-tropical to temperate regions with high concentration of diversity in drier parts of the tropical climates.

To effectively tap the varied uses of castor, availability of diverse germplasm that harbours good traits *viz.*, production potential, tolerance/resistance to biotic and abiotic stresses is essential. Evaluation of castor germplasm in the hot-spot areas has resulted in identification of number of resistant/moderately resistant accessions to fusarium wilt. However, explorations in new areas to collect the diverse germplasm sources harbouring resistance to botrytis gray rot and fusarium wilt, the two major biotic challenges in castor cultivation at present (Padmaraju and Ashok Kumar, 2002) are necessary. Efforts were made to collect, conserve and study the variability from the entire country (Anjani *et al.*, 1999, Duhoon *et al.*, 1996). An exploration was undertaken to augment germplasm from this unexplored area and to find out sources of resistance to botrytis gray rot and wilt, was undertaken in parts of telangana region and coastal districts of Andhra Pradesh under NATP-Plant biodiversity project during December 2001. The material has been deposited in the National Gene Bank (NGB) NBPGR, New Delhi for conservation.

Materials and Methods

The survey was undertaken in four districts of Andhra Pradesh *viz.*, Warangal, Khammam, West Godavari and Guntur, with varied agro-ecological system and having a tradition of growing castor as a shade crop in ginger and turmeric fields. The districts Warangal and Khammam form part of northern Telangana zone, and receive an annual average rainfall of 900-1150 mm from the south west monsoon with the maximum and minimum temperatures of 32°C - 37°C and 21°C - 25°C respectively. The region is predominated by red soils. The districts West Godavari and Guntur (under Krishna–Godavari Zone) receive an average rainfall of 800-1100 mm with maximum and minimum temperatures of 32°C-36°C and 23°C-24°C with predominantly alluvial, red and black soils. Keeping in view the collection gaps in the representative diversity of castor a survey team of breeders and botanists focused on collection of diversity in castor after procurement of the mandal wise information

on area under castor cultivation from Directorate of Statistics and Economics. The research stations of Acharya NG Ranga Agricultural University (ANGRAU) at Warangal, Malyal and Maruteru were consulted for identifying potential areas for castor germplasm collection during the survey. The altitude of the area surveyed (30-460 m) and route map of the survey were depicted in (Fig). Mature capsules/heads/seeds as per the availability were collected following random (Hawkes, 1976) and biased (Harlan, 1975) sampling methods to collect specific genotypes (Sinha, 1981).

Results and Discussion

A total of 122 castor germplasm accessions comprising

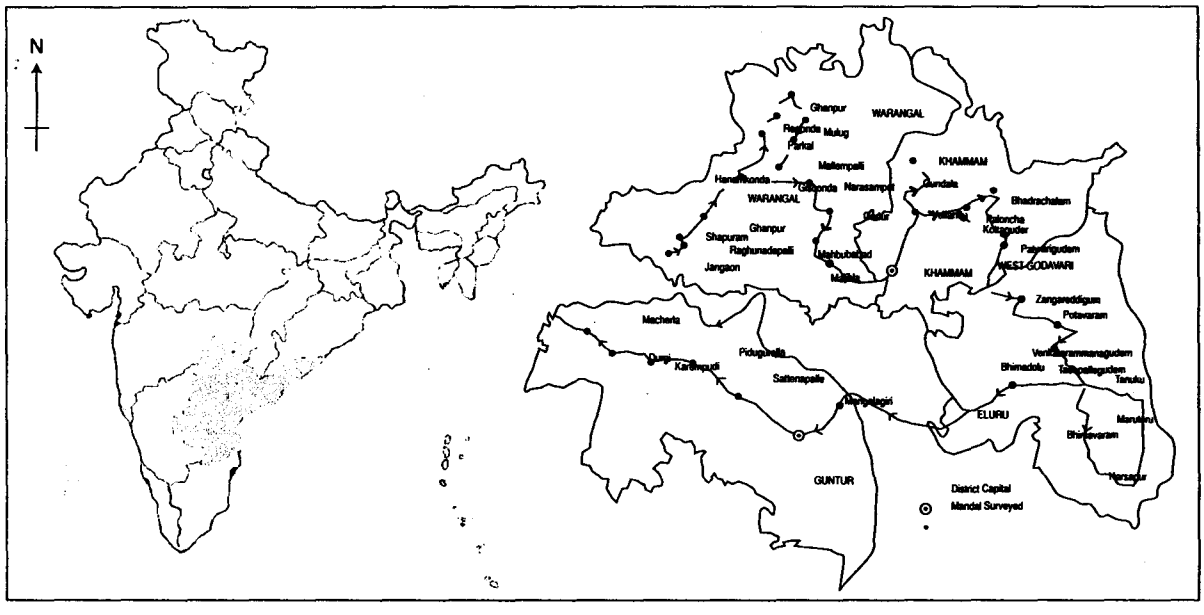

Fig: Route map of the survery undertaken for collection of castor germplasm in Warangal, Khamman, West Godavari and Guntur districts of Andhra Pradesh

of 63 from the cultivated fields being grown as a trap and shade crop in cotton and ginger fields as a trap and 59 from wild and semi wild areas along roadsides and wastelands were collected from 66 villages in four districts of Andhra Pradesh. The castor collections exhibited variations in stem colour (green, red and pink),bloom (zero, single, double and triple bloom), node number (low and high), plant height (dwarf,medium and tall), nature of raceme (partially female, female raceme and male raceme), spike size (small, medium and large) and shape of spike (cylindrical and triangular), compactness of spike (compact and loose), nature of capsule (spiny and non-spiny) and dehiscence of capsule (dehiscent and non-dehiscent).

Three distinct plant types *viz*., tall and woody (68%), medium tall (26%) and dwarf types (6%) were observed among the collections. Tall and woody types grown as a border crop on crop bunds were found free from wilt and these may harbor sources of resistance/ tolerance to wilt (Table 1). Medium and dwarf types of castor were grown mainly as an inter crop in cotton and as a shade crop in turmeric and ginger. Colour of the stem varied as red (64%), green (30%) and pink (6%) among collective germplasm. Green stem character is highly heritable and is used as distinguishable morphological feature in varietal identification (Anonymous, 2004).

The presence of bloom, is an important character towards resistance to sucking pests, of the collected accessions. 20% had zero bloom (no waxy coating on aerial parts), 19% single bloom (waxy coating on stem and peduncles only), 53% double bloom (waxy coating on stem, peduncles and lower portion of of the leaf) and 16% had triple bloom (waxy coating on stem, peduncles, lower and upper portions of the leaf). In castor, jassid infestation is the lowest in accessions with triple bloom nature while that of white fly and thrips is lowest in accessions with zero bloom (Table 2). There is excellent variability available in the present collections for bloom nature.

The accessions collected varied in node number, wherein 17% of the accessions had a very high node

Table 1. Tall and Woody Accessions–Probable Sources for Wilt Tolerance

Traits	Accessions
Tall and woody	IC-329684,IC-329687,IC-329692, IC-329693 IC-329695,IC-329696,IC-329697,IC-329700, IC-329701,IC-329710,IC-329713,IC-329720, IC-329721,IC-329722,IC-329731,IC-329738, IC-329740,IC-329749, IC-329750,IC-329751, IC-329753,IC-329755,IC-329756,IC-329758, IC-329759,IC-329766,IC-329768,IC-329777, IC-329778, IC-329782,IC-329787

Table 2. Germplasm lines with zero and triple bloom-probable sources for white fly and Jassids tolerance receptively

Trait	Accessions
Zero bloom	IC-329668,IC-329684,IC-329704,IC-329714, IC-329733,IC-329740,IC-329741,IC-329742, IC-329758,IC-329760,IC-329761,IC-329762, IC-329763,IC-329767,IC-329770,IC-329773, IC-329776,IC-329776,IC-329781,IC-329782 IC-329783,IC-329784,IC-329785,IC-329788, IC-329790
Triple bloom	IC-329676,IC-329679,IC-329680,IC-329685, IC-329687, IC-329694,IC-329707,IC-329718, IC-329737,IC-329744,IC-329747,IC-329748, IC-329750,IC-329789,IC-329791,IC-329793, IC-329797, IC-329800, IC-329801

number, while 10% of accessions had low node number (Table 3). The germplasm accessions with low node number were of dwarf types with early maturing nature. Early maturity is highly desirable in castor to fit in to various cropping systems. In low rainfall conditions unequal distribution and early cessation, early maturing genotypes are desirable. Moreover early maturing genotypes escape the heavy incidence of botrytis grey rot which generally appears late in the season.

The size and nature of the spike, *viz.*, very long (90-100 cm) with 90 per cent female flowers showed direct positive relation with yield (Raghuram Reddy *et al.*, 2000) in castor. In the collections, 10% showed long spike nature, which is highly desirable.

The loose spikes prevent free movement of capsule borer and spread of *botrytis grey rot,* is an important character preferred by plant breeders. 65 per cent of the accessions exhibited loose spike nature. In most of the long duration varieties of castor the presence of a non-dehiscent capsule is beneficial, 80% of the accessions had non-dehiscent capsules. In the castor

Table 3. Accessions having low node number-Probable early maturing types

Trait	Accessions
Low node	IC-329681,IC-329683,IC-329685,IC-329699 IC-329719,IC-329748,IC329769, IC329773, IC-329774, IC-329797

Table 4. Non-spiny and loose spikes-probable sources for grey rot tolerance

Traits	Accessions
Non - spiny and loose spikes	IC-329669,IC-329694,IC-329711, IC-329717,IC-329792,IC-329796, IC-329798,IC-329799,IC-329800, IC-329801

germplasm accessions collected 90% of the capsules were spiny and 10% non-spiny. Non-spiny entries generally showed low incidence of botrytis gray rot, e.g. 48-1, Kiran. Presence of high humidity is very congenial for infection and spread of Botrytis fungus. In non-spiny entries as spines on capsules are absent the water drops are not retained on capsule thus the microclimate is not suitable for the growth and spread of fungus. Accessions having loose sipke and non spiny capsules are given in table 4. Accession having pink coloured capsules (IC-329696) were identified as genetic marker in varietal identification programmes.

All the above desirable characters observed in the collected castor germplasm accessions will be of immense value in castor improvement programmes. However, the entries have to be screened further in wilt sick plots (for wilt) and culture room conditions (for botrytis gray rot) to identify promising sources of resistances/tolerance.

Acknowledgements

The authors are thankful to Dr BS Dhillon, Farmer Director, National Bureau of Plant Genetic Resources, New Delhi, Dr. SK Pareek, Principal Investigator, NATP (PB) and Dr Ravi Khetarpal, Head, Division of Plant Quarantine, NBPGR New Delhi for their help and encouragement.

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