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Research Note

Genetic evaluation of *Celastrus paniculatus* Willd. accessions for yield and related traits

Raviraja Shetty. G[1], Poojitha K.G[*1], Souravi. K[2] and Rajasekharan. P.E[2]
1. Dept. of Plantation, Spices, Medicinal & Aromatic crops, College of Horticulture, Mudigere, India
2. Division of Plant Genetic Resources, Indian Institute of Horticultural Research, Hessaraghatta, Bangalore, India
* Email: rajasekharan.pe@gmail.com

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Abstract
Six accessions of Celastrus paniculatus Willd., a threatened species known for its medicinal properties, were evaluated in terms of variability, heritability and genetic advance for yield and other contributing traits. Genotypic coefficient of variation and phenotypic coefficient of variation were highest for plant height followed by leaf area and seed yield per plant. High heritability and high genetic advance over mean were observed for seed yield per plant (97.90%), leaf width (96.30%), leaf area (95.30%), fruit diameter (89.60%), leaf length (89.60%), plant height (87.80%) and seed length (86.20%) thus indicating that these characters had additive gene effect and hence, they can be used for effective selection.

Keywords
Celastrus paniculatus, Selection, crop improvement, yield.

Celastrus paniculatus Willd. belonging to the family Celastraceae, is a large, woody, climbing shrub, distributed almost all over India up to an altitude of 1800 m (Nadkarni, 1976). It is also found in middle and South Andaman. Ayurveda, the ancient Indian traditional system of medicine has used this plant seed for prevention and treatment of various diseases (Vaidyarathnam, 1997). The bark is abortifacient, depurative and a brain tonic. The leaves are emmenagogue and the leaf sap is a good antidote for opium poisoning. The seeds are acrid, bitter, thermogenic, emollient, stimulant, intellect promoting, digestive, laxative, emetic, expectorant, appetizer, aphrodisiac, cardiotonic, anti-inflammatory, diuretic, emmenagogue, diaphoretic, febrifuge and tonic, used for disorders, leprosy, pruritus, skin diseases, paralysis, cephalalgia, arthralgia, asthma, leucoderma, cardiac debility, inflammation, nephropathy, amenorrhoea, dysmenorrhoea (Sivaranjan and Balachandran, 1994). The seed oil is bitter, thermogenic and intellect promoting and is useful in abdominal disorders, beri-beri and sores (Shastri and Chunekar, 2008).

As the seeds are economic parts in the species, bulk harvesting of seeds hinders the natural regeneration. Hence, the population of this plant has decreased exponentially in the last few years in their natural habitat. Due to several medicinal and commercial uses the conservation of this very plant is of utmost importance. Hence selection of superior genotypes for improvement through morphological traits helps in further improvement and conservation. By conducting exploration programmes in hotspots , six different accessions of *C. paniculatus* Willd. have been established at the Field Gene Bank of Division of Plant Genetic Resources, Indian Institute of Horticultural Research, Bengaluru. Magnitude of variability present in genetic stocks, heritability and genetic advance are important parameters for effective selection and crop improvement. Therefore, the present studies was undertaken with a view to assess the extent of genetic variation among the available. *paniculatus* Willd. accessions.

The present investigation was conducted in the Field Gene Bank of Division of Plant Genetic Resources, Indian Institute of Horticultural Research, Bengaluru. Six different accessions CP 15, KAR RET – 169, KAR RET – 152, KAR RET – 156, KAR RET – 68 and KAR RET – 175 were grown in randomized block design with three replications. Plants were maintained organically and recommended cultural practices were adopted for proper growth and stand of the plants. The observations were recorded on nine quantitative traits of the selected plants from each of the accessions and its replications. The data were subjected to analysis of variance as per the procedure described by Panse and Sukhatme (1967). The co-efficient of phenotypic and genotypic variations were calculated according to Burton and DeVane (1953). Heritability, genetic advance and genetic gain were calculated according to the formula of given by Johnson *et al.* (1955).

High genotypic and phenotypic coefficients of variation were recorded for plant height (39.86% and 42.55 %), leaf area (31.39% and 32.15%) and seed yield (31.13% and 31.46%) (Table 1). This shows greater genetic variability among accessions for these characters, to carry out further improvement by selection. Phenotypic and genotypic coefficients of variation were quite low for leaf length, leaf width, petiole length, fruit length, fruit diameter and seed length. Similar results also obtained by Singh *et al*. (2004), Kakaraparthi *et al*. (2013), Ahmad and Khaliq, (2002), Rahman *et al*. (2010) and Qmen (2011). The result obtained revealed that the estimates of phenotypic coefficient of variation (PCV) were higher than genotypic coefficient of variation (GCV). Although estimates of PCV were higher than that of GCV, they were close to one another which implies that the influence of environment on the expression of these characters were negligible and therefore selection based on phenotypic values is possible.The lowest GCV was noticed for petiole length and fruit length.

The amount of genetic variation present for different desirable traits can be known by the estimation of genetic coefficient of variation whereas the proportion of variation which is inherent can be estimated by heritability. Heritability alone can be used to gather information of relative value of selection, but Johnson *et al*., (1955) had shown that for better and reliable conclusion, both heritability and genetic advance should be considered.

Heritability estimates were high for characters like seed yield (97.90%), leaf width (96.30%), leaf area (95.30%), leaf length (89.60%), fruit diameter (89.60%), plant height (87.80%) and seed length (86.20%). From the above heritability values, it can be concluded that these characters are less influenced by the environmental factors and are controlled by additive gene effect (Table 1). Petiole length and fruit length recorded low heritability. In confirmation with the obtained results, Yadav *et al*. (2007), Singh *et al*. (2004), Kakaraparthi *et al*. (2013) and Chitra and Rajamani (2010) have also reported higher heritability values for these traits in medicinal crops like Safed musli, Opium poppy, Ashwagandha and Glory lily respectively.

In the present experiment high genetic advance over mean, coupled with high heritability was observed in characters like plant height (76.92%), seed yield (63.46%) and leaf area (63.14%). Hence, the present results show that the all the characters had high high genetic advance coupled with high heritability values except for petiole length and fruit length which suggests that existing variability among the accessions with respect to these traits is mainly due to additive type of genes (Panse, 1957 and Thrombe and Joshi, 1981). These traits can be improved through simple individual plant selection to bring out genetic improvement in desired selection.

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Table 1: Variability, heritabity and genetic advance of the various acessions of *C. paniculatus* Will

Sl. No.	Characters	Mean ±S.Em	Range	GV	PV	GCV (%)	PCV (%)	h^2 (%)	GA	GAM (%)
1	Plant height (cm)	209.27	344-130	6959.34	7929.90	39.86	42.55	87.80	160.99	76.92
2	Leaf length (cm)	6.42	7.90-4.73	1.022	1.14	15.72	16.61	89.60	1.97	30.65
3	Leaf width (cm)	4.03	5.00-3.08	0.464	0.48	16.90	17.23	96.30	1.37	34.17
4	Petiole length (cm)	4.40	5.43-3.51	0.207	0.72	10.32	19.37	28.40	0.49	11.33
5	Leaf area (cm^2)	26.47	39.56-14.61	69.06	72.46	31.39	32.15	95.30	16.71	63.14
6	Fruit length (cm)	1.02	1.25-0.88	0.011	0.037	10.08	18.90	28.50	0.11	11.08
7	Fruit diameter (cm)	2.12	2.59-1.51	0.12	0.14	16.70	17.64	89.60	0.69	32.58
8	Seed length (cm)	0.22	0.30-0.18	0.002	0.003	19.20	20.69	86.20	0.08	36.72
9	Seed yield (kg/plant)	1.54	2.05-0.67	0.235	0.23	31.13	31.46	97.90	0.97	63.46