

## Genetic variability studies in *Jatropha* (*Jatropha curcas* L.)

■ ANAMIKA NATH, P.A. TAJANE, TARUNA AMRAWAT AND AMEENA KUMARI MEENA

### SUMMARY

The present investigation on genetic variability studies in *Jatropha* (*Jatropha curcas* L.) was undertaken to study the extent of genetic variability, heritability (bs), genetic advance in 30 genotypes of *Jatropha*. The parameters of genetic variability revealed high PCV and GCV values for the traits number of secondary branches per plant, oil content, number of fruits per plant, number of clusters per plant. The PCV values were higher than GCV values for all the traits. The highest magnitudinal difference between GCV and PCV was recorded for number of primary branches per plant followed by number of clusters per plant indicating the role of environment in phenotypic expression of the trait. The lowest difference between GCV and PCV was found for number of secondary branches per plant, oil content and seed yield per plant indicating the major role of genotypes in the expression of these characters.

**Key Words :** Variability, Genetic, Heritability, *Jatropha*

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**J**atropha has been found highly promising species which can yield oil seed as a source of energy in the form of bio-diesel owing to its short gestation period, hardy nature, high quality oil content etc. In field condition this may produce the seed yield as high as 3-5 tonnes per ha per year after five years of plantation (Jones and Miller, 1992), while 0.8 to 1.0 kg of seed per meter of live fence can be obtained if it is planted for hedge (Henning, 1996). The oil content of seeds represents reasonable opportunities for renewable fuel (Schultz and Morgan, 1985; Princen, 1983 and Harrington, 1986). Its seed contains about 30-40 per cent non edible oil. A yield of 0.7-2 tonnes of bio-diesel

could be expected per ha per year from the fifth year onwards (Fiodl and Eder, 1997). For any crop improvement programme needs the information regarding the range of existing genetic variability and the relationship of the various economically important characters related to yield. The present investigation, was, therefore, undertaken to study the extent of variability and the character association between yield and yield components.

### MATERIAL AND METHODS

Thirty genotypes of *Jatropha curcas* were evaluated in a Randomized Block Design (RBD) with three replications. The experiment was conducted at All India Co-ordinated Research Project on Agroforestry, Mahatma Phule Krishi Vidyapeeth, Rahuri. (M.S.), during *Kharif*, 2010. The trees were planted at the distance of 3m × 3m. The plot size was 12 m × 9m for gross and 6m × 3m for net. In each replication, for each entry, five plants were selected at random for recording observations for ten characters *i.e.* plant height (cm), collar diameter of the plant (cm), number of primary branches, number of secondary branches, number of clusters per plant, number of fruits per plant, 100 seed weight (g), shelling percentage, oil content (%) and seed yield per plant

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**Table 1: Analysis of variance for ten characters in Jatropha**

Sr. No.	Character	Mean sum of squares		
		Replications (2)	Treatments (29)	Error (58)
1.	Plant height (cm)	662.03	1819.72**	537.37
2.	Collar diameter (cm)	0.32	1.68**	0.62
3.	No. of primary branches per plant	1.41	4.95**	2.61
4.	No. of secondary branches per plant	8.01	547.46**	23.63
5.	No. of clusters per plant	4.41	9.30**	3.53
6.	No. of fruits per plant	26.53	43.70**	8.54
7.	100-seed weight(g)	3.86	25.97**	15.32
8.	Shelling percentage (%)	4.59	8.20**	4.37
9.	Oil content (%)	1.32	91.61**	4.98
10.	Seed yield per plant (g)	0.07	230.54**	43.42

\*and \*\* indicate significance of values at P=0.05 and 0.01, respectively. Figures in parentheses indicate the degree of freedom

**Table 2: Estimates of variability parameters for eleven different characters of Jatropha**

Sr. No	Characters	Range	General mean	PCV	GCV	Heritability (%) (b.s.)	Genetic advance	Genetic advance as per cent of mean
1.	Plant height(cm)	171.33-254.66	224.0	13.86	9.23	44	28.34	12.65
2.	Collar diameter (cm)	7.84-10.74	9.40	10.50	6.34	36	0.74	7.84
3.	No. of primary branches per plant	9.00-15.33	11.51	16.01	7.67	23	0.87	7.57
4.	No. of secondary branches per plant	30.33-69.33	51.08	27.56	25.86	88	25.54	50.05
5.	No. of clusters per plant	9.66-10.00	13.42	17.41	10.33	35	1.69	12.63
6.	No. of fruits per plant	20.00-35.00	26.90	16.73	12.27	57	5.36	19.93
7.	100 seed weight (g)	51.33-63.96	55.90	7.73	3.37	18	1.68	3.01
8.	Shelling percentage (%)	31.87-39.51	35.88	6.62	3.14	22	1.10	3.08
9.	Oil content (%)	13.37-37.00	25.94	22.42	20.71	85	10.22	39.39
10.	Seed yield per plant (g)	68.29-94.68	78.52	13.09	10.05	59	12.49	15.90

(g). Statistical analysis was done as per Panse and Sukhatme (1967). Mean, range, components of variance, co-efficients of variation and genetic advance were worked out using standard statistical procedures. Path analysis was carried out according to the method suggested by Dewey and Lu (1959).

## RESULTS AND DISCUSSION

The analysis of variance (Table 1) revealed highly significant differences among the genotypes for all ten characters studied. In the present investigation, considerable amount of variability was observed for all the ten characters studied. The variability observed for seed yield per plant ranged between 68.29 g and 94.68 g with a mean of 72.52 g, likewise other yield contributing characters showed wide range of variability viz., plant height (171.33-254.66 cm), collar diameter (7.84 – 10.74 cm), number of primary branches per plant (9.00 – 15.33 cm), number of secondary branches per plant (30.33 – 69.33 cm), number of fruits per plant (20 – 35), 100-seed weight (51.33 – 63.33 g) shelling percentage (31.87 – 39.51 %) oil content (13.39 – 37 %) (Table 2). In the present investigation the PCV and GCV estimates were of high magnitude for number of secondary branches per plant, oil content and number of fruits per plant. These results were confirmed by earlier findings of Das *et al.* (2008); Kaushik *et al.* (2007) and More (2008) for number of secondary branches per plant. The characters 100-seed weight, collar diameter and plant height exhibited very low GCV and PCV estimates suggesting narrow range of variation confirming the earlier findings of Ginwal *et al.* (2005), for collar diameter; Kaushik *et al.* (2007) for 100 seed weight. Low estimates of GCV value of 100 seed weight, collar diameter and plant height indicated limited scope for improvement of these traits due to narrow range of variability. The magnitudinal differences between GCV and PCV were highest for number of primary branches per plant (8.34) followed by number of clusters per plant (7.11, number of clusters per plant, plant height, 100-seed weight. In the present investigation, high magnitudes of heritability were recorded by number of secondary branches per plant followed by oil content and seed yield per plant indicating major role of genotype in the expression of these traits indicating additive gene action and ultimately less environmental effect. Similar result were reported by Kaushik *et al.* (2007), Rao *et al.* (2008), Ginwal *et al.* (2005) for oil content and More (2008) for number of secondary branches per plant. Moderate heritability with low genetic advance was recorded for collar diameter and number of clusters per plant presence of non-additive gene action. These results are in agreement with the results of Ginwal *et al.* (2005).

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