

Seed morphometrics study of *Jatropha curcus* L. of North-east India for the potentiality of oil content

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SUMMARY

The paper deals with the detail study of the morphological characteristics of seeds, viz., seed weight, seed kernel weight, seed coat weight, seed length, seed breadth, seed thickness and colour of the *Jatropha curcus* L. of north-east India. The study suggested the kernel weight and kernel percentage affect the seed weight of *Jatropha curcus* L. However, variation of coat percentage has no effect on kernel weight and kernel percentage.

Key Words : *Jatropha*, Seed morphometrics, North-east India

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Seed morphology serves as a source of systematic characters to circumscribe sub generic groups or hypothetical relationship among species within a genus (Mathews and Levins, 1986; Augustine *et al.*, 2001). The morphological characters of seeds not only serve as taxonomical markers but also serve in deducing phylogenetic relationship. The morphometric characters of seeds are ever challenging to the taxonomic and phylogenetic issues that would be a great help both in academic as well as in applied ventures (Rani *et al.*, 1993). Different morphological characters together with seed yield are necessary for identification of suitable selection criteria for developing high yielding varieties.

Jatropha curcus L. is a prominent plant with wide variety of uses. Seeds, leaves and bark are used in traditional medicine and for veterinary purposes. The oil has a strong purgative action and is widely used for skin diseases and to soothe rheumatic pain. A decoction of leaves is used against cough

and as an antiseptic after birth (Heller, 1996a and 1996b).

Environmental factors in combination with genetic and physiological factors play important role in determination of plant potential for seed quality. These characters appear to be under strong genetic control (Roy and Chinsamy, 2004). Depending on the species, responds of seed vary according to geographical and environmental factors, viz., latitude, elevation, soil moisture, soil nutrient, temperature, type and density of plant cover, degree of habitat disturbance where the seed mature. So far, only few records are available for *Jatropha* species where an attempt has been examined the genetic variation for seed characters (Ginwal *et al.*, 2005).

MATERIALS AND METHODS

Well developed matured seeds of *Jatropha curcus* L. were collected from various parts of the North-Eastern India. Seeds were properly dried under sunlight. Data on the following parameters of the seeds were taken into consideration – i). Seed length ii). Seed breadth iii). Seed thickness iv). Weight of the seeds v). Weight of the kernels vi). Weight of the seed coat vii). Percentage of the kernel viii). Percentage of whole seed coat ix). Seed colour and x). Seed type. The seed weight, seed length, breadth and thickness were measured using the method of Ginwal *et al.* (2005). Weight was taken in an electric digital balance while measurements for length, breadth and thickness were taken with the help of

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slide caliper and Vernier scale. For each parameter measurements were taken from 50 seeds. Finally mean values of each parameter were considered.

The percentage of 50 whole kernels and 50 whole seed coats were calculated using the formula as given below :

$$\text{Percentage of 50 whole kernels} = \frac{\text{Total weight of 50 whole kernels}}{\text{Total weight of 50 seed}} \times 100$$

$$\text{Percentage of 50 whole seed coat} = \frac{\text{Total weight of 50 whole seed coat}}{\text{Total weight of 50 whole seed}} \times 100$$

The correlation of seed traits of both the species were calculated from the seed characters associated to each other by the method of Karl Pearson's (Gupta, 1999) using the formula :

$$r = \frac{n \sum xy - (\sum x)(\sum y)}{\sqrt{n(\sum x^2) - (\sum x)^2} \sqrt{n(\sum y^2) - (\sum y)^2}}$$

where,

'x' and 'y' are series of two associate characters to be compared.

RESULTS AND DISCUSSION

Investigations on the seed morphometrics revealed that the weight of 50 seeds (whole seed with seed coat) varied from 0.69 g to 0.83 g in *Jatropha curcus* L. Similarly the weight

of 50 kernels, ranged from 0.42 g to 0.52 g. The weight of seed coat of 50 seeds varied from 0.28 g to 0.30 g. The length of the seeds ranged from 15.85 mm to 19.01 mm while the breadth varied from 9.39 mm to 11.18 mm. The thickness of the seeds was in between 8.05 mm to 9.01 mm. Percentage of kernels ranged between 57.17 per cent and 65.21 per cent and the percentage of seed coats were in between 36.01 per cent and 39.37 per cent. Mean values of seed weight, kernel weight, seed coat weight, seed length, seed breadth, seed thickness, percentage of kernel and percentage of seed coat were 0.77 ± 0.01 , 0.47 ± 0.00 , 0.29 ± 0.00 , 17.27 ± 0.08 , 10.31 ± 0.06 , 8.46 ± 0.03 , 62.00 ± 0.29 and 37.93 ± 0.11 , respectively (Table 1). The colour of the seeds of *Jatropha curcus* L. was blackish, while the seed type was ecuranulate type.

The significant positive correlations were observed between kernel weight and seed weight (0.636); kernel percentage and kernel weight (0.819). However, the significant negative correlations were observed between coat percentage and kernel weight (-0.874) and between coat percentage and seed thickness (-0.991). Thus, it suggests that the kernel weight and kernel percentage affect the seed weight of *Jatropha curcus* L. However, variation of coat percentage has no effect on kernel weight and kernel percentage (Table 2).

The seed characters exhibited considerable variations in respect of the parameters considered in the present study. These were weight of the seeds, length of the seeds, breadth

Table 1: Characteristics of seeds

Parameters	<i>Jatropha curcus</i> L.	
	Range of unit values	Mean value
Seed length (mm)	15.85-19.01	17.27 ± 0.08
Seed breadth (mm)	9.39-11.18	10.31 ± 0.06
Seed thickness (mm)	8.05-9.01	8.46 ± 0.03
Weight of single 50 whole seeds (g)	0.69-0.83	0.77 ± 0.01
Weight of single 50 whole kernel (g)	0.42-0.52	0.47 ± 0.00
Weight of single 50 whole seed coats (g)	0.28-0.30	0.29 ± 0.00
Percentage of single 50 whole kernela	57.17-65.21	62.00 ± 0.29
Percentage of single 50 whole seed coat	36.01-39.37	37.93 ± 0.11
Seed colour	Blackish	
Seed type	Ecuranulate	

Table 2 : Correlation between seed traits

	Seed wt.	Kernel wt.	Coat wt.	Seed length	Seed width	Seed thickness	Kernel %	Coat %
Seed wt.	100	<u>0.636</u>	0.388	0.076	-0.130	-0.054	0.422	-0.489
Kernel wt.		100	0.186	0.212	-0.084	-0.010	<u>0.819</u>	<u>-0.874</u>
Coat wt.			100	-0.059	-0.053	0.323	0.035	-0.069
Seed length				100	-0.047	-0.166	0.205	-0.202
Seed breadth					100	0.188	-0.082	0.061
Seed thickness						100	-0.030	0.020
Kernel %							100	<u>-0.991</u>
Coat %								100

of the seeds, thickness of the seeds, weight of the kernels, percentage of the kernels, percentage of the seed coats, colour of the seed and type of the seed. Earlier Ginwal *et al.* (2005) also reported variations in the seed traits of *Jatropha curcus* L.

The significant positive correlation was observed in between seed weight and kernel weight (0.636) and for kernel percentage and kernel weight (0.819). On the other hand, significant negative correlations were found in between kernel weight and percentage of seed coat (-0.874) and between percentage of kernel and percentage of seed coat (-0.991).

Earlier studies on different plant species reported the significant positive and negative correlation of seed traits and inferred that seed germination and oil content both are associated with the seed traits. Prabhu *et al.* (2006) reported that the seed sources variation in root trainer seedlings of Teak. Similarly, Bagchi and Sharma (1989) reported seed character variation of *Santalum album* and Neelamver *et al.* (2006) reported on the plant *Alizia lebbeck* (L.) Benth. Ginwal *et al.* (2005) also reported that the seed morphometrics play important role in determination of plant potential for seed quality required for bio-fuel production.

The present investigation showed that the *Jatropha curcus* L. was found to be potential for bio-fuel production. The length, breadth, thickness of the seeds and percentage of kernels also clearly indicated the potentiality and high quality.

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