

**Research Article****Studies on flowering behavior and seed yield of BC<sub>4</sub>F<sub>1</sub> hybrid progenies in *Jatropha*****Umamaheswari.D, K.Sumathi, R.Jude Sudhagar, P.S.Devanand, PL. Viswanathan and M.Paramathma****Abstract**

Field investigation was carried out by the Centre of Excellence in Biofuels, TNAU, Coimbatore during kharif 2009, to study the number of male and female flowers per cluster and seed yield per plant in BC<sub>4</sub>F<sub>1</sub> progenies of *Jatropha*. The eighteen BC<sub>4</sub>F<sub>1</sub> progenies used in this study were developed from interspecific hybridization of *Jatropha curcas* x *J. integerrima* followed by four repeated backcrossing with *Jatropha curcas* (TNMC-7). Based on the *per se* performance, three introgressed progenies viz., 3-20-9-3, 3-20-9-2 and 3-95-7-5-4 were found to be significant for the traits viz., number of female flowers per cluster and seed yield per plant.

**Key words:** *Jatropha*, Interspecific hybridization, BC<sub>4</sub>F<sub>1</sub> progenies, Female flowers

**Introduction**

*Jatropha* commonly known as physic nut or purging nut is a large shrub or tree native to the South American tropics. It has been identified in India as the most suitable Tree Borne Oil seed species (TBOs) for production of biodiesel both in view of the non edible oil availability and its presence throughout the country (Paramathma *et al.*, 2009). There are many species of *Jatropha*, among which *J. curcas* is the most promising species having economic seed yield and oil recovery (Ranwah *et al.*, 2009). Due to increased demand for fossil fuels, increased energy consumption, high prices and associated environmental degradation, considerable interest is being shown towards the development and commercial use of biofuels. Owing to the low yield potential of wild *J. curcas* as well as to introduce useful traits found in other *Jatropha* species, it becomes essential to undertake interspecific hybridization in *Jatropha*. Interspecific hybridization in *Jatropha* plays a significant role in crop improvement by transferring useful traits such as high oil content, maximum number of seeds, more femaleness and hard stem for promotion of *Jatropha* as a biofuel crop (Parthiban *et al.*, 2009). Among the different interspecific crosses in *Jatropha* species, the cross between *Jatropha curcas* x *J. integerrima* followed by repeated back crossing with *J. curcas* has resulted in BC<sub>4</sub>F<sub>1</sub>

generation. As numbers of female flowers per cluster and seed yield per plant in *Jatropha* are important traits to be studied in such hybrids. Hence, the present investigation involved studying the number of female flowers per cluster, working out the male to female ratio and seed yield per plant in 18 BC<sub>4</sub>F<sub>1</sub> hybrid progenies.

**Material and methods**

The field experiment was conducted during kharif (mid June 2009) in a three year old existing field, planted during 2006. Spacing adopted was 3m x 2 m. The eighteen BC<sub>4</sub>F<sub>1</sub> hybrid progenies used in this study (Table 1) were developed from interspecific hybridization of *Jatropha curcas* x *J. integerrima* and back crossing to *J. curcas*. Among these hybrid progenies, three hybrid progenies namely NCH-1, NCH -2 and NCH 3 were developed by open pollination. To study the number of male and female flowers, three randomly selected flower clusters were tagged and enumeration was done and seed yield per plant was estimated.

**Results and discussion**

Among the eighteen hybrid progenies studied, the mean value for number of female flower per cluster ranged from 19.00 to 6.00. Three hybrid progenies viz., 3-20-9-3(19.0), 3-20-9-2 (18.60) and 95-7-5-4 (18.33) were found to be significant. With respect to seed yield per plant, the mean value varied from

285.10(g) to 26.90(g) and six hybrid progenies viz., 3-20-9-3 (285.10 g), 95-7-5-4 (176.40g), 3-20-9-1(144.70g), 3-20-9-2(124.80g), 3-75-95-10(106.20g) and 3-7-10-4-4(104.70g) recorded significant value (Table 1). Since there are limited studies in this area, the present investigation has been attempted. Towards realizing the objective mentioned in this investigation, three superior hybrid progenies were selected based on the *per se* performance for both the traits viz., number of female flower per cluster and seed yield per plant. Since *J. curcas* is a cross pollinated crop, multiplication through seeds results in variation at both phenotypic and genotypic levels. So to bring about homogeneity at the genotypic level, the three selected hybrid progenies viz., 3-20-9-3, 3-20-9-2 and 3-95-7-5-4 were forwarded to clonal multiplication in order to hasten the breeding programme.

#### References

- Paramathma, M., P. Venkatachalam and A. Sampathrajan. 2009. *Jatropha* improvement, management and production of biodiesel. Pub: TNAU, Coimbatore. P. 11-15.
- Parthiban K.T., R. Senthil kumar, P. Thiyagarajan, V. Subbulakshmi, S. Vennila and M. Govinda Rao. 2009. Hybrid progenies in *Jatropha* – a new development. **Curr. Sci.**, **96(6)**: 815-823.
- Ranwah, .R., S.S. Sinha, M.A. Shah, Lakshyadeep and T.C. Bochalya. 2009. *In situ* variability in Physic nut, *J. curcas* L, **J. Oilseeds Res.**, **26**: 237-239.

**Table 1 Mean performance of BC<sub>4</sub>F<sub>1</sub> hybrid progenies for male; female flowers/cluster and seed yield (g) per plant**

Sl.No	Hybrid Progenies	No. of Female flowers/cluster	No. of Male flowers/cluster	Female to Male flower ratio	Seed yield/plant (g)
1	3-66-29-1-2	11.00	114.58	10.42	55.70
2	3-7-10-4-6	11.33	145.60	12.85	42.70
3	3-75-95-10	12.33	175.00	14.19	106.20*
4	3-56-13-1-31	8.25	120.36	14.59	27.10
5	3-66-29-1-8	10.33	155.20	15.02	43.20
6	3-66-19-6-3	6.00	85.69	14.28	26.90
7	3-66-59-4-1	10.33	125.33	12.13	23.80
8	3-91-1-c12-1-7	10.00	147.00	14.70	41.40
9	3-66-59-4-3	8.00	108.67	13.58	38.90
10	3-7-10-4-25	11.66	169.67	14.55	46.80
11	3-7-10-4-4	15.00	152.00	10.13	104.70*
12	95-7-5-4	18.33*	279.68	15.26	176.40*
13	NCH-2	11.33	147.00	12.97	43.50
14	NCH-3	14.00	189.95	13.57	60.40
15	NCH-4	12.60	175.89	13.95	70.40
16	3-20-9-1	12.30	178.00	14.47	144.70*
17	3-20-9-2	18.60*	295.80	15.90	124.80*
18	3-20-9-3	19.00*	312.56	16.45	285.10*
	<b>Grand Mean</b>	12.24	170.99	13.83	81.26
	<b>S.Ed</b>	1.98	12.82		0.28
	<b>C.D(0.05)</b>	2.98	26.07		0.60

\*... Significance at 5% level

**Table 1. Number of Female and male flower cluster in interspecific hybridization of *Jatropha curcas***

S.NO.	Progenies	Replication of female flowers			Average	Replication of male flowers			Average	Female to male ratio
		1st cluster	2nd cluster	3rd cluster		1st cluster	2nd cluster	3rd cluster		
1	3-66-29-1-2	9	7	8	8.00	90	77	92	86.33	1:11
2	3-7-10-4-6	7	8	9	8.00	31	71	105	69.00	1:7
3	3-75-9-5-10	11	8	12	10.33	125	117	118	120.00	1:11
4	3-56-13-1-31	8	7	10	8.33	69	68	103	80.00	1:10
5	3-66-29-1-8	8	6	9	7.67	102	98	99	99.67	1:17
6	3-66-19-6-3	7	6	5	6.00	73	110	98	93.67	1:16
7	3-66-59-4-1	9	10	12	10.33	107	152	117	125.33	1:12
8	3-91-1-c12-1-7	11	9	10	10.00	145	160	136	147.00	1:15
9	3-66-59-4-3	8	7	9	8.00	143	100	153	132.00	1:17
10	3-7-10-4-25	6	9	9	8.00	152	185	172	169.67	1:21
11	3-7-10-4-4	15	18	12	15.00*	397	355	285	345.67	1:23
12	3-95-7-5-4	17	23	15	18.33*	384	482	362	409.33	1:22
13	NCH-2	10	14	10	11.33*	238	420	385	347.67	1:31
14	NCH-3	15	13	14	14.00*	357	256	332	315.00	1:23
15	NCH-4	8	6	8	7.33	245	230	273	249.33	1:34
16	3-20-9-1	11	12	14	12.30*	268	322	354	314.67	1:26
17	3-20-9-2	12	14	13	19.00*	282	312	362	318.67	1:25
18	3-20-9-3	17	21	19	13.00*	320	412	386	372.67	1:20
	Parents									
	Check- TNMC-7 ( <i>Jatropha curcas</i> )	8	10	9	9.00	122	140	125	129.00	1:14
	<i>Jatropha integerrima</i>	6	5	4	5.00	36	27	32	31.67	1:7
	S.Ed				1.47				30.77	
	C.D				2.97				62.29	

\* Significant at 5% level, NCH-Natural cross hybrids