

## STUDY OF CERTAIN SEED ATTRIBUTES IN DEVELOPING SEEDS OF CASTOR (*Ricinus communis* L.)

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The investigation conducted to study certain seed attributes in developing seeds of varieties of castor at 5 different dates of harvesting at G. A. U., Sardar Krushinagar during 1979-80 revealed that the most rapid development of the seed attributes took place during the first two dates of harvesting (36 days after flowering). GAUCH-1 and GCH-3 can be harvested safely at 60 and 48 days after flowering, respectively, without loss of seed weight and oil content.

The castor is one of the most important cash crops of Gujarat, in general, and North Gujarat in particular. The differences in various seed characters are observed in different varieties. Such variations are also observed when the crop is harvested at different stages of its maturity, i. e. when harvested before physiological maturity, there is risk of losing both seed weight and oil content, and when harvested late there is possibility of losses caused by shattering. Such informations are reported by Chand *et al* (1978) in sunflower, but these informations are not available in castor. Therefore, the present investigation was undertaken to study the time course of the development of certain attributes viz., 100 seed weight, endosperm percentage and oil content in developing seeds of seven varieties of castor at five dates of harvesting, which would be of great value to decide the proper harvesting time of released as well as promising varieties of castor to realize the maximum yield potential without losing the oil content.

### MATERIALS AND METHODS

The trial was conducted with 7 castor varieties/hybrids in a randomized block design with 3 replications at Gujarat Agricultural University, Sardar Krushinagar during *kharif* 1979-80. Each plot consisted of single row of 6m length. The spacing followed was 120 cm between rows and 60 cm between plants within row. Five competitive plants were randomly selected and tagged for each treatment in each replication. The date of flowering was noted for main spike of each tagged plant. The main spike of selected plants were harvested at 24 (H<sub>1</sub>), 36 (H<sub>2</sub>), 48 (H<sub>3</sub>), 60 (H<sub>4</sub>), and 72 (H<sub>5</sub>) days after flowering as per the treatment. The bulked capsules of main spike of five plants in each treatment per replication were threshed after sun drying. The bulked seeds, thus obtained, were utilized for recording observations on 100 seed weight and endosperm percentage, and also for oil analysis by cold percolation method as suggested by Kartha and

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Sethi, (1956). The statistical analysis was done as suggested by Snedecor and Cochran, (1967).

## RESULTS AND DISCUSSION

The results obtained are presented

in Table 1 and 2. There were significant differences among treatments for all three characters studied (Table 1). The significant differences were due to varieties, harvesting dates and also due to interaction of variety  $\times$  dates of harvesting (Table 2).

Table 1 : Mean Values for 3 attributes in developing seeds of 7 varieties of Castor.

Variety 1	Treatment 2	Seed weight (g) 3		Endosperm (%) 4		Oil content (%) 5	
GAUC-1	(H-1)	11.0	(41.8)	49.9	(59.1)	23.1	(46.5)
	(H-2)	19.7	(74.7)	75.0	(88.7)	41.9	(84.5)
	(H-3)	24.3	(92.4)	76.7	(90.7)	47.4	(95.5)
	(H-4)	25.7	(97.5)	84.6	(100.0)	49.6	(100.0)
	(H-5)	26.3	(100.0)	73.1	(-15.7)	49.3	(-0.6)
GAUCH-1	(H-1)	18.0	(37.0)	61.1	(73.4)	8.8	(17.7)
	(H-2)	19.7	(72.9)	73.1	(87.9)	47.3	(94.9)
	(H-3)	24.3	(90.1)	83.3	(100.0)	47.4	(95.2)
	(H-4)	26.9	(99.5)	80.6	(-3.3)	49.8	(99.9)
	(H-5)	27.0	(100.0)	75.0	(-11.0)	49.8	(100.0)
GCH-3	(H-1)	9.0	(39.1)	50.0	(59.6)	24.9	(49.7)
	(H-2)	19.0	(82.6)	81.3	(96.8)	49.2	(98.0)
	(H-3)	23.0	(100.0)	83.9	(100.0)	50.2	(100.0)
	(H-4)	22.7	(-1.5)	77.3	(-8.6)	48.2	(-4.0)
	(H-5)	22.7	(-1.5)	73.1	(-14.9)	49.7	(-0.8)
VHB-89	(H-1)	8.7	(37.7)	50.0	(64.0)	17.5	(33.1)
	(H-2)	19.7	(85.5)	76.1	(97.3)	45.5	(86.1)
	(H-3)	22.3	(97.3)	68.1	(87.1)	46.3	(87.5)
	(H-4)	23.0	(100.0)	74.2	(95.0)	51.8	(97.9)
	(H-5)	23.0	(100.0)	78.2	(100.0)	52.9	(100.0)
VHB-90	(H-1)	9.0	(40.4)	38.9	(50.1)	15.6	(30.2)
	(H-2)	19.0	(85.2)	72.6	(93.6)	51.7	(100.0)
	(H-3)	22.0	(98.7)	73.9	(95.2)	49.5	(-4.5)
	(H-4)	22.0	(98.7)	75.8	(97.8)	49.4	(-4.7)
	(H-5)	22.3	(100.0)	77.6	(100.0)	49.2	(-5.2)
VHB-106	(H-1)	9.3	(37.3)	50.0	(59.7)	8.0	(15.4)
	(H-2)	20.0	(80.0)	83.8	(100.0)	46.9	(90.5)
	(H-3)	23.7	(94.7)	80.1	(-0.9)	50.1	(96.6)
	(H-4)	25.0	(100.0)	77.5	(-8.2)	51.9	(100.0)
	(H-5)	24.7	(-1.3)	76.2	(-10.0)	51.0	(-1.8)
VHB-150	(H-1)	9.7	(36.7)	50.0	(57.8)	12.2	(24.6)
	(H-2)	22.7	(86.1)	73.1	(84.5)	47.2	(95.1)
	(H-3)	24.7	(93.7)	86.5	(100.0)	48.8	(98.2)
	(H-4)	26.3	(100.0)	77.3	(-11.9)	49.7	(100.0)
	(H-5)	26.3	(100.0)	76.2	(-13.6)	47.5	(-4.7)
Range		8.7	to 27.0	38.9	to 86.5	8.0	to 52.9
SEM		0.74		4.47		1.82	
C. D. (5%)		2.11		12.76		5.19	
C. V. (%)		6.27		10.79		7.46	

N. B. :- Figures in parentheses represent per cent based on the maximum value obtained at a stage in a variety.

The 100 seed weight ranged from 8.67 to 27.00 g for various treatments (Table 1). VHB 150 recorded the highest followed by VHB 106, GAUCH 1 and GAUC 1, while it was lowest for VHB 90. It is evident from the Table 2 that the rate of increase in seed weight was the highest during 36 days after flowering. However, there was slow and gradual increase upto the last stage of harvesting. It is, further, evident that there was no significant increase in seed weight after 3rd date of harvesting (H<sub>3</sub>), indicating that almost full development of seed took place during 48 days after flowering. The significant, variety × date of harvesting interaction indicated that the rate of development of seed weight of various varieties were not consistent at different

dates of harvesting. Thus, the seed weight reached its maximum at last date of harvesting (H<sub>5</sub>) in GAUCH 1 and VHB 90, where as it reached maximum at (H<sub>4</sub>) in VHB 89, VHB 106 and VHB 150. It was interesting to note that the seed weight reached its maximum at 48 days after flowering (H<sub>3</sub>) in GCH 3, there after it decreased. Similar situation was observed with VHB 106 where the seed weight decreased after reaching its maximum at (H<sub>4</sub>). These two hybrids are shattering type and undergo heavy losses due to shattering when harvesting is delayed. The full development of seed during H<sub>3</sub> in GCH 3 and H<sub>4</sub> in VHB 106, is highly desirable as these hybrids can be advocated to be harvested earlier without losing seed weight.

Table 2 : The mean values for different seed attributes for 7 varieties and 5 different harvesting stages in castor.

Varieties	Seed weight (g) 1	Endosperm (%) 2	Oil Content (%) 3
GAUC-1	21.40	71.85	35.31
GAUCH-1	21.53	74.62	34.31
GCH-3	19.27	73.20	38.14
VHB-89	19.33	69.31	36.18
VHB-90	18.87	67.75	36.27
VHB-106	20.53	73.50	36.69
VHB-150	21.93	72.62	35.48
SEm +	0.28	2.09	0.81
CD (5%)	0.80	5.72	2.32
CV (%)	6.27	10.79	7.46
Harvesting stages :			
H 1	9.52 (38.7)	49.99 (63.3)	15.43 (30.8)
H 2	19.95 (81.0)	76.49 (96.9)	47.11 (94.1)
H 3	23.47 (95.3)	78.92(100.0)	48.55 (97.0)
H 4	24.47 (99.4)	78.18 (- 0.9)	50.05 (100.0)
H 5	24.62 (100.0)	75.60 (- 4.4)	49.90 (- 0.03)
SEm +	0.33	1.69	0.68
CD 5%	0.94	4.83	1.96

N. B. :- Figures in parentheses indicate the percentage of maximum values.

The endosperm percentage ranged from 38.88 to 86.52 for various treatments (Table 1). The highest endosperm content was observed for GAUCH 1 (74.62%) followed by that for VHB 106, GCH 3 and VHB 150, while it was lowest for VHB 90 (Table 2). The maximum endosperm development took place during 36 days after flowering ( $H_2$ ), when 76.49% of the endosperm was formed. The full development of the endosperm took place during 48 days after flowering ( $H_3$ ) which was followed by gradual decrease. This decrease in endosperm content may be due to the desiccation effect of the endosperm after it reached the physiological maturity and almost got detached from the mother plant. The significant interaction of variety and harvesting dates clearly indicated that the varieties exhibited differential behaviour with respect to endosperm development at various dates of harvesting (Table 1).

The wide range of variability (7.97 to 52.88%) was observed for oil content for various treatments (Table 1). The maximum oil content was observed for GCH 3 followed by that for VHB 106 and VHB 90. The results obtained further indicated that the maximum accumulation of oil in seeds occurred during 36 days after flowering ( $H_2$ ) when 94.12% of the oil was formed. This was followed by the slow but gradual increase reaching its maximum during 60 days after flowering ( $H_4$ ) which in turn was followed by slight decrease in the final date of harvesting ( $H_5$ ). The significant variety x harvesting dates interaction indicated that the diffe-

rent varieties showed different rates of oil accumulation at the different stage of harvesting (Table 1). Thus, the oil accumulation reached maximum at  $H_4$ ,  $H_5$ ,  $H_3$ ,  $H_4$ , and  $H_4$  in GAUC 1, GAUCH 1, GCH 3, VHB 90, VHB 106, and VHB 150, respectively. It was further observed that the oil content decreased due to delayed harvesting in GCH 3, VHB 90, VHB 106 and VHB 150.

A perusal of results, thus, indicated that the present recommended non-shattering hybrid GAUCH 1 and the variety GAUC 1 can safely be harvested at 60 days and that of GCH 3 at 48 days after flowering without appreciable loss of seed weight, endosperm weight and oil content.

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