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Oil and Protein Accumulation in the Developing Seeds of Bhendi (*Abelmoschus esculentus*) (L)Moench*

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Accumulation of oil and protein was found to occur throughout the development and maturation of the seeds. In ten day old seeds, the oil and protein ranged from 19.6 to 20.8 and from 52.8 to 61.7 per cent respectively of the total. A maximum of 14.8 per cent of oil and 9.63 per cent of prorein was recorded from fully matured seeds.

Bhendi is one of the common vegetables and the developing seeds in the young fruits are said to be highly nutritious. In some countries the matured seeds are fed to cattle as a concentrate besides extraction of oil. To understand the pattern and extent of accumlation of oil and protein in the developing seeds studies were conducted in the popular variety "Pusa Sawani".

MATERIAL AND METHODS

A field trial was laid out with variety *Pusa sawani* adopting split-plot design with three replications during April, 1975. There were seven main treatments and four sub-treatments. The main treatments represented collection of seeds from 5, 10, 15, 20, 25, 30 and 35 days old fruits while the four sub-treatments being the first (F1), fourth (F4), seventh (F7) and tenth (F10) fruits in a plant.

In each main plot, which consisted of ten rows with 20 plants in each row, from the middle eight rows, adjacent two rows were allotted randomly for each sub-plot treatment. Thus each sub-plot treatment consisted of 40 plants. In each plant excepting the single fruit meant for the study, all the other fruits were harvested as vegetable. At the time of anthesis, flowers were labelled with details of date of flowering and the date on which they have to be picked for separation of seeds. Accordingly 40 fruits were available from each replication for each one of the 7x4 treatments. The fruits were harvested at the specified time of development and the seeds were extracted and dried. From dried seeds, samples were drawn and powdered well. The procedure adopted by Christiansen and Moore (1961) was followed with a known quantity of powder for estimating the oil. Samples of 100 mg of the oil-free residue of the powdered seed material was taken to estimate the protein content by the calorimetric method of Ali-khan and Youngs (1973).

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The oil content was minimum in 5 days old seeds and varied from 2.71 (F10) to 2.89% (F4) while it was maximum in fully matured seeds, the range being from 14.87 (F1) to 13.95% (F10). The rate of accumulation of oil was rather slow upto ten days and thereafter singnificant increases were observed upto 20th day. The accumulation of oil content after 20th day was again gradual. The trend of oil accumulation in the seeds from fruits collected at different parts of the plant was similar though the differences were significant among them.

The difference in protein content estimated at five days interval varied significantly, and there was steady increase in its accumulation upto 30-th day. Comparison of protein content in the seeds from fruits harvested from different positions on the plant revealed similarity in the deposition of protein in the developing seeds though the differences were significant among them.

RESULTS AND DISCUSSION

The oil of bhendi had a pleasing, greenish yellow colour and a slight but distinct fragrant odour. Accumulation of oil was found to take place through out the development period of the seed though the rate of its accumulation varied among the stages of maturity. Nainawatee and Kartha (1972) have reported similar results. The percentage of oil varied from 13.95 to 14.87 in the matured seeds. Jamieson and Baughman (1919) recorded 15.60 per cent edible oil from ripe bhendi seeds. Mayer (1973) has attri-

TABLE. Percentage of oil and protein content in 5, 10, 15, 20, 25, 30 and 35 days old seeds, collected from 1st, 4th, 7th and 10th fruits in variety "Pusa Sawani".

Fruit No.	Days of flowering						
	5	10	15	20	25	30	35
Oil							
F1	2.88	2.92	6 28	12.17	12.46	14.86	14.87
F4	2.89	2 95	7.30	9.04	13.06	14.09	14.15
F7	2.82	2.90	7.35	12.19	13.15	14.05	14.07
F10	2.71	2.81	6.10	9.02	12.35	13.52	13.95
Protein							
F1	5.94	6.09	7.17	8 09	9.17	10 40	9.63
F4	5.94	6.09	7.01	7.17	9.17	9.48	9.17
F7	4.94	5.94	6.86	7.63	8.86	9.32	9.32
F10	5.01	6.40	6.71	7.99	8 55	8.55	9.48

	Oil		Protein	
	S.Ed.	C. D.	S.Ed.	C.D.
Stages of maturity in each position of fruit	0.084	0.173	0.226	0.464
Position of fruit in each stage of maturity	0.084	0.173	0.226	0.464

buted the accumulation of fats as one of the biochemical changes that takes place during seed formation. In cotton seed, up and downs were observed in the oil accumulation during the seed development (Ganieva *et. al.* (1970) and Memam and Mallik (1969). Oil content was found to be associated with size of seed. According to Classen *et. al.* (1950), oil content of kernel in sunflower seed was found to have possitive correlation with size.

The accumulation of protein was gradual and steady during the development and maturation of the seed. One interesting feature is that in 10 days old seeds, which is more or less the stage when the fruits are picked for vegetable, the oil content was from 19.6 to 20.8 per cent and the protein content was from 52.8 to 61.7 per cent of the total present in the matured seed. Gurnovitch (1973) reported continuous deposition of protein throughout the development of bean seeds *(Phaseolus vulgaris)*. In the present study a maximum of 9.63 per cent protein was recorded. It was also observed that as the protein content of the seed increased, the dry weight of seedlings also increased. Lowe *et. al.* (1972) reported that the seedling dry matter showed a high positive correlation with seed protein content in wheat.

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