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STUDIES ON FRUIT AND SEED DEVELOPMENT IN CHILLI

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In Chilli Co 1 and Co 2, the seeds reached their physiological maturity (maximum seed dry weight) 48 days after anthesis coincident with the green colour of pericarp turningcapsicum red and the majority of the seeds expressing high percentage of germin ability and vigour.

Successful crop production is basically conditioned by the quality of the seed planted. The prime quality attributes of a good seed are maximum viability, germinability and vigour, all dependant on the quantity of nutrient accumulated and the full complement of the enzymes, besides the inter play of the hormones present in it during its development and maturation following fertilization. These quality attributes mentioned may be impaired while the seeds are still developing on the mother plant and further modfications may be imposed during harvesting, processing and storage (Pollock and Roos 1972).

Agronomy of chilli seed production processing and storage of good quality seeds had not received considerable attntion. Seed maturation and development had been studied by a few researchers (Cochran, 1943; Karivaratharaju and Nagarajan 1977), but their findings differed presumably due to genetic and environmental variables, although there was unanimity in respect to the visual index of harvestable maturity namely, the reddening of the pericarp on ripening of the fruit. Hence, the present investigation was undertaken to study the course of seed development and maturation as a preliminary to evolve a package of practices for adoption in quality seed production.

MATERIALS AND METHODS

Studies carried out on the fruit and seed development with fruits collected at six-day intervals from six to 60 days (Serially designated as S_1 to S_{10}) after anthesis of long fruited (Samba type) chilli Co. 1 (V_1) and oblong fruited Co. 2 (V_2) employing the criteria such as the fresh and dry weight changes of fruit and its components namely, pericarp, placentum and seed, seed to pericarp + placentum ratio, seed moisture content, germination, field emergence, root and shoot lengths, dry matter production and vigour index of the seedlings at different stages. The germination percentage and vigour index were

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determined as per the procedures outlined by Abdul Baki and Anderson (1973).

The study of fruit and seed development was carried out by employing certain criteria refelcting their development and maturation namely, fresh and dry weight of fruit, pericarp, placentum and seed, seed to pericarp+ placentum ratio, seed moisture content, germination, field emergence, root and shoot length, dry matter production and vigour index of the seedlings with a view to obtaining an overall estimate of these correlates to determine the infleunce of the stage of maturity on the germinability, vigour and storability potentials of the seeds.

RESULTS AND DISCUSSION

The fresh weight of fruit of V_1 (Chilli Co. 1) showed rapid increase upto 36 days after anthesis and a graudal decrease during the subsequent period upto 54 days after anthesis beyond this period there was a steep fall in fresh weight of this fruit. The fresh weight of fruit of V_2 (Chilli Co. 2) had, however, showed rapid increase only upto 30 days after anthesis and a gradual increase until 48 days after anthasis and thereafter decreased considerably. The trend of increase in fruit dry weight was similar in respect to both the cultivars and had almost paralleled that of the fresh weight except for its continued increase upto 48 days after anthesis. There was appreciable decrease in the dry weight of fruit in both the varieties during the subsequent period of monitoring of fruit development. The assessment of fresh and dry weights of the pericarp, placentum and seeds of the fruits of the cultivars revealed that they exhibited increase and decrease nearly paralleling those of the whole fruit weight. The pericarp in both the cultivars contributed most to the overall fresh and dry weights of the fruit followed by the seed. The contribution to the overall fresh and dry weight ot the fruit by the placentum was the leasf (Table 1 and 2).

The seed to pericarp + placetum ratios in the cultivars exhibited two peak values, the one on the 12th day and the other on the 60th day after anthesis. The increasing trend of seed to pericarp + placentum ratio observed during the first 12-day period after anthesis had clearly revealed that the pericarp of the fruit alone had developed rapidly while the endosperm and zygote of the fertilized ovules were presumably undergoing cell division and differentiation to form the storage tissue and the embryo, respectively. The decreasing values determined during the subsquent period of development until the 42nd and 48th day after anthesis, respectivly in V_1 and V_2 had clearly indicated that during this period the differentiated endosperm and embryo had undergone an increase in size and weight due to the enlargement of cells of different tissues and accumulation of reserve food substances and other biomolecules chiefly in the endosperm. This assumption was meaningfully confirmed by the relatively high germination and field emergence encountered in the seeds collected on the 42nd and 48th

Table 1. Changes in criteria (parameters) evaluated during fruit and seed development

	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}	SED	CD
a. Co. 1 Chilli												
Fruit fresh weight (g)	0.273	0.985	1.712	1.974	2.484	2.931	2.761	2.664	2.239	1.671	0.129	0.252**
Fruit dry weight (g)	0.014	0.082	0.162	0.244	0.386	0.602	0.626	0.656	0.613	0.571	0.028	0.054**
Pericarp fresh weight (g)	0.217	0.613	1.119	1.312	1.715	2.088	2.034	1.890	1.523	1.079	0.172	0 336**
Pericarp dry weight (g)	0.011	0.053	0.109	0 132	0.196	0.266	0.278	0.256	0.239	0.233	0.015	0 030**
Placentum fresh weight (g)	0 016	0.083	0.114	0.124	0.151	0.157	0.118	0.128	0.114	0.086	0 012	0.024**
Placentum dry weight (g)	0.001	0.008	0 012	0 012	0.016	0.018	0.013	0.014	0.013	0.012	0.001	0 002**
Seed fresh weight (g)	0.041	0.288	0 479	0.538	0.618	0.686	0.610	0.646	0.601	0.506	0.044	0.081**
Seed dry weight (g)	0 002	0.021	0 041	0.100	0.174	0.318	0.336	0.386	0.361	0.327	0.019	0.037**
Seed/Pericarp+Placentum ratio	0.18	0 41	0 38	0.37	0.33	0.31	0.28	0.32	0.37	0.43	0.105	0.206**
Seed moisture content (%)	95.1 (78.49)	92.7 (74.26)	91 4 (72.70)	81.4 (64.68)	71.8 (57.41)	53 6 (46.97)	44 9 (41.58)	40.2 (39.45)	39.9 (37.7)	35 4 (36.29)	1.319	2.613**
Germination (%)	—	—	—	—	—	1 (19.00)	92 (73.93)	99 (86.17)	97 (32.33)	97 (82.33)	4.788	11.04**
Field emergence (%)	—	—	—	—	—	—	61 (51.43)	85 (67.5)	85 (67.5)	84 (66.5)	3.524	8.62**
Root length (cm)	—	—	—	—	—	5.47	7 37	9 60	9.47	9.63	0.373	0.859**
Shoot length (cm)	—	—	—	—	—	6.37	9.43	10.83	10.67	10.50	0.392	0.905**
Dry matter production (mg)	—	—	—	—	—	1.87	2.17	2 53	2.53	2.47	0.0816	0.883**
Vigour index	—	—	—	—	—	125	1541	2015	1961	1959	46	106**

** Significant at P = 0.01

Table 2. Changes in criteria (parameters) evaluated during fruit and seed development

	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}	SED	CD
b. Co. 2 Chilli												
Fruit fresh weight (g)	0.083	0.977	1.492	2.291	2.902	2.957	3.051	3.700	2.938	2.053	0.179	0.355**
Fruit dry weight (g)	0.005	0.081	0.124	0.290	0.465	0.609	0.678	0.854	0.782	0.723	0.026	0.051**
Pericarp fresh weight (g)	0.059	0.541	0.903	1.529	2.201	2.124	2.155	2.776	2.107	1.343	0.161	0.319**
Pericarp dry weight (g)	0.003	0.046	0.075	0.160	0.239	0.244	0.273	0.371	0.329	0.299	0.017	0.034**
Placentum fresh weight (g)	0.006	0.056	0.077	0 070	0.102	0.089	0.100	0.108	0.088	0.069	0.014	0.027**
Placentum dry weight (g)	0.001	0.006	0.008	0.008	0.011	0.009	0.011	0.013	0.010	0.011	0.001	0.003**
Seed fresh weight (g)	0.017	0.379	0.511	0.629	0.599	0.743	0.796	0.816	0.743	0.641	0.062	0.122**
Seed dry weight (g)	0.001	0.029	0.041	0.122	0.215	0.353	0.394	0.469	0.442	0.411	0.021	0.042**
Seed: Pericarp—Placentum ratio	0.26	0.63	0.52	0.38	0.26	0.34	0.35	0.28	0.34	0,45	0.039	0.077**
Seed moisture content %	94.1	92.3	92.0	80.6	64.1	52.5	50.5	42.5	40.5	35.6	1.654	3.279**
	(74.70)	(73.6)	(73.46)	(63.79)	(52.97)	(46.30)	(45.23)	(40.24)	(39.39)	(35,9)		
Germination (%)	—	—	—	—	13	37	76	96	96	96		
					(21.4)	(37.67)	(60.73)	(80.70)	(80.70)	(78.50)	4.527	10.08**
Field emergence (%)	—	—	—	—	—	21	53	84	84	83		
						(27.13)	(47.03)	(66.50)	(66,50)	(65.40)	4.372	10.03**
Root length (cm)	—	—	—	—	4.20	5.80	7.43	9.20	9.13	9.20	0.360	0.801**
Shoot length (cm)	—	—	—	—	6.20	7.03	8.77	10.67	10.50	10.33	0.363	0.809**
Dry matter production (mg)	—	—	—	—	1.70	1.83	2.20	2.53	2.47	2.50	0.076	0.168**
Vigour index	—	—	—	—	136	482	1233	1907	1885	1875	76	169**

** Significant at P — 0.01

day and beyond after anthesis, respectively from the fruits of V_1 and V_2. The incredible spurt in the germination of seeds noticed beyond 36th day after anthesis in V_1 had only indicated that in the majority of the seeds set,the diff erentiated embryos had attained repaid and synchronous development and maturation with the accumulation of relatively large amounts of reserve food substances, as clearly indicated by the enhanced values of seed dry weight concomitant with the reduction in seed moisture contents as well as by the increasing values of root and shoot lengths of the seedlings and vigour index recorded during this period. In V_2, however, the seeds became germinable on the 30th day after anthesis, and there after more and more of them became germinable until 48 the day after anthesis and this increasing trendin the germinability and field emergence percentages of seeds had in this instance also, paralleled the changes in fresh and dry weights of seeds and their moisture content, as well as in seedling length and vigour index.

It was interesting to notice an onset of a gradual change in the pigmentation of the pericarp in the cultivars coincident with the seeds becoming germinable the pericarp was green and when there was sudden spurt in germination of seeds on the 42nd day after anthesis the green pigmentation had started breaking into bronze-green to bronze-red.

On 48th day after anthesis when the germination and field emergence percentages of the seeds were maximum in the varieties, the pericarp turned capsicum red in colour. At this stage of maturity, the seed dry weight, seedling length and vigour index were also maximal indicating that the seeds had attained the physiological maturity only when the pericarp of the pods had turned from green to completley capsicum red. These observations made in respect to the physiological maturity of seeds were in conformity with the ones reported by Cochran (1943); Sakr and Mahmoud (1952); Gikalo (1966); Spaldon and Pevna (1964); Nassar *et. al.*, (1972); Karivaratharaju and Nagarajan (1977) and Quagliotti (1977) in different cultivars of *Capsicum annum* and hence the capsicum red colour attained by the pericarp of the mature and ripened fruit could be regarded as the visual index for harvesting in order to obtain good quality seeds.

The decline in fresh and dry weights at the maturing seeds could be related to the decreasing moisture content (Thomas, 1972) as well as to the respiration of seeds after they had attained physiological maturity Anderson and Anderson, 1980).

The apparent reduction in the seed vigour, as became evident from the vigour index values, was obviously due to the fact that this criterion adopted to comprehend the adstract quality attribute of the seed namely, the vigour was a product of multiplication of the mean gremination percentage with the total seedling length.

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EFFECT OF SEED TREATMENT WITH FUNGICIDES AND INSECTICIDES ON THE VIABILITY OF PEARL MILLETSEEDS DURING STORAGE

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Seeds treated with carbendazim at 2 g+ thiram at 6 g per kg and thiram at 6 g per kg of seed recorded higher germination than untreated seeds. A standard slurry treatment of DDT 50% WPat 200mg with 2 g of thiram per kg of seed also recorded higher germination. However germination in seeds treated with HCH and malathion at 10 g per kg of seed recorded lower germination.

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