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EFFECT OF SEED SIZE ON PHYSICO-CHEMICAL CHARACTERISTICS OF SEEDS IN GROUNDNUT (*ARACHIS HYPOGAEA* L.) cv. POL 1 AND TMV 2*

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Investigations were carried out to understand the inter-relationship of seed size with physico-chemical characteristics in groundnut cv. POL 1 and TMV 2. The large size seeds retained by 21/64" and 20/64" diameter round perforated sieves possessed significantly high 1000 seed weight and weight of primary axis, but the per cent weight of primary axis to weight of cotyledons was high in small size seeds retained by 18/64" and 16/64" diameter round perforated sieves. The EC value of leachate increased with increase in seed size. Though it is contradictory to the accepted vigour concept it may be attributed due to lack of membrane integrity in large seeds of groundnut due to invisible cracks developing during processing. The protein content and total free fatty acid content showed positive correlation with seed size. The oil content exhibited negative relationship in both the varieties.

The size of seeds plays an important role on the physicochemical characteristics of seeds of major crops. Malm (1968) observed in sorghum hybrids, the embryo weight to be proportional to the grain weight. Ries (1971) reported a positive correlation between bean kernel size and protein content. In groundnut, Mital and Mehta (1954) and El Saeed (1967) found a negative correlation of seed size with oil content, whereas Claassen *et al.* (1950) reported positive correlation of oil content with seed size in safflower. The present study was undertaken with the two popular varieties namely, POL 1 and TMV 2 to determine the effect of seed size on the physico-chemical characteristics like test weight, electrical conductivity, oil, free fatty acid and protein contents.

MATERIALS AND METHODS

Seeds of two bunch type groundnut varieties namely, POL 1 and TMV 2 were obtained from the Regional Agricultural Research Station, Tindivanam and multiplied under irrigated condition at Seed Technology Department, Tamil Nadu Agricultural University, Coimbatore, adopting the recommended package of practices for each variety with a view to eliminate the variability due to locality, if any. The harvested pods were shelled and kernels were size-grades without any visible damage by using metal sieves possessing 21/64", 20/64", 18/64" and 16/64" diameter round perforation,

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respectively. The studies comprised laboratory evaluation of seeds of different sizes excluding those passed through the sieve. 16/64" as they were mostly shrivelled and immature ones. The percentage recovery of each size of seed in seed lots of 10 kg in each variety was thus estimated.

The mean 1000-seed weight in respect to each size grade was determined. The primary axes from 25 seeds in each seed size were carefully separated, weighted individually and mean weight per kernel was calculated. Oil refraction by using oil refractometer was determined for each size grade.

The EC of the leachate of 50 seeds soaked for 18 hr in 50 ml of distilled water was determined in duplicates by using Elico type con. 82 conductivity bridge and expressed in micromhos/cm. The oil content of different grades was estimated in duplicate by using Soxhlet extractor. The total free fatty acid content of the oil was assessed in duplicate by volumetric method of Christiansen and Moore (1961). The free fatty acid was calculated as per cent oleic acid using the formula of Karon and Altschul (1944)

The protein content of seeds in percentage was estimated by the Colorimetric method of Alikhan and Youngs (1973), utilizing the meal of the ground material used for oil analysis.

RESULTS AND DISCUSSION

The data on recovery percentage of seeds in each size grade presented in table revealed that the per cent recovery of seeds retained by the sieves, 21/64", 20/64" and 18/64" was already relatively high in POL1; in TMV 2, it was high only in the size grades of 20/64",18/64" and 16/64", thereby indicating that the cv. POL 1, was characterised by predominantly bold seed and the cv. TMV 2 was characterised by the possession of medium sized seeds.

The 1000-seed weight showed a very high positive correlation with seed size in both the varieties (Table). The 1000-seed weight of large size seed fraction was 105.08 per cent and 65.48 per cent more than that of 16/64" retained seeds in POL 1 and TMV 2 respectively. Similarly, increase in seed weight due to seed size was reported also in corn and groundnut (Sivasubramanian and Ramakrishnan, 1974).

The weight of primary axis showed a positive correlation with the seed size (Table). In large size seed the increase in the primary axis weight was 35.81 per cent over the smallest seed in POL 1 variety; the corresponding percentage increase in weight due to increased seed size was only 10.98 in TMV 2. The percentage weight of primary

axis to the weight of cotyledon showed a high negative relationship in both the variety, evidently due to greater quantity of reserve food stored in large size seeds.

Table Effect of seed size on physico-chemical characteristics of seeds in POL 1 and TMV 2 groundnut [Mean values]

Seed sizes	Recovery	Weight of 1000 seeds [g]	Primary axis weight per kernel [mg]	Per cent primary axis weight to weight of cotyledons	E. C. michro-mhos/cm°	Oil refraction	Oil content [%]	Total FFA % as oleic acid	Protein content %
POL 1									
21/64"	34.50	435.6	11.00	2.47	913	0.14	46.7	0.65	30.9
20/64"	28.50	361.5	10.27	2.86	768	0.14	47.4	0.61	28.5
18/64"	23.70	293.1	10.10	3.37	627	0.14	48.1	0.54	27.8
16/64"	11.30	212.4	8.10	3.75	572	0.14	49.3	0.49	26.6
Ungraded	—	350.6	10.40	2.83	715	0.14	48.0	0.39	28.7
TMV 2									
21/64"	11.70	395.4	9.10	2.24	825	0.14	46.2	0.64	31.5
20/64"	23.00	342.3	8.90	2.63	775	0.14	46.6	0.47	30.2
18/64"	34.00	293.2	8.40	3.41	745	0.14	47.7	0.34	28.5
16/64"	24.60	237.5	8.20	3.68	649	0.14	48.5	0.34	27.2
Ungraded	—	312.5	8.70	2.84	660	0.14	47.4	0.35	29.6
'r' POL 1 : 0.973* TMV 2 : 0.726*		0.974**	0.679NS	-0.974**	0.867**	-0.935**	0.155NS		0.921**

The oil refraction values did not show any relationship with seed size in either varieties thereby indicating no variation in the quality of oil.

The oil content of the seeds of various sizes estimated and furnished in table indicated that in both POL 1 and TMV 2, the 21/64" retained seeds contained 46.68 and 46.2 per cent oil, respctively compared with the oil content of 49.3 and 48.5 per cent of 16/64" retained seeds of the respective varieties. Thus, the smallest size seeds contained 5 3 and 4.7 per cent more oil than the largest seeds respectively in POL 1 and TMV 2. The high negative correlation obtained in the present study in respect to this attribute is in conformity with the

results of Mital and Mehta (1954) and El Saeed (1967) in groundnut.

The protein content was found to increase with increase in seed size in both the varieties The precentage of protein obtained from 21/64" and 16/64" retained seeds were respectively 30.9 and 26.6 in POL 1 and 31.5 and 27.2 in TMV 2. Irrespective of the varieties, the protein content showed a linear relationship with seed size; such increase in protein content as influenced by seed size was also reported in soybean (Fehr and Weber, 1968) and in groundnut (Sivasubramaniam and Ramakrishnan, 1974).

The total free fatty acid estimated as per cent of oleic acid was the highest, 0.65, for 21/64" retained seed and the lowest, 0.49, for 16/64" retained seed in POL 1 and 0.64 and 0.34 for the respective sizes of seeds in TMV 2. The positive correlation obtained in respect to total free fatty acid (FFA) content had thus meaningfully revealed the linear relationship with seed size in POL 1 and TMV 2. The seed coat of peanut is rich in tannoid substances (Pickett, 1941). Tannins are powerful anti-oxidants, and unless these are rendered ineffective such phenomenal increases in FFA content are not normally possible in any size of seed. Larger seeds easily develop invisible cracks or fissures on the seed coat and lose the concomitant oxidation of tannoid substances in those regions, resulting in the concomitant oxidation of the oil, leading to enahanced free fatty acid inthem (Gelmond, 1971).

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