

**NOTE****Study of Dibasic Elements in Indian Soybeans and Their Association with Density and Shape of Seed**

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The total mineral, calcium and magnesium contents were analyzed in some Indian soybean variety seeds, collected from four different locations. The seed density and sphericity (*i.e.*, roundness or shape) were also analyzed to ascertain their association with metal elements. It was observed that the planting location makes statistically significant effect on total ash, calcium and magnesium contents of soybean seeds whereas the varietal variation has significant effect only on total ash. The correlation analysis of these parameters with seed density indicates negative association of seed density, total ash, calcium and magnesium whereas the sphericity has significant association only with total ash.

**Key Words:** Soybeans, Dibasic elements, Density, Sphericity.

The ash content of soybean is fairly high. Soybean contains more divalent cations such as calcium and magnesium that interfere with cooking<sup>1</sup>. Therefore the divalent cations could possibly be reduced to a level that facilitates easy cooking of soybean without sacrificing its nutritional value. Considerable research has been done to evaluate the variation of minerals in soybean<sup>2</sup> but there are very few references with regard to Indian soybeans. The purpose of the present investigation was to determine the extent of variation in total mineral and dibasic metal element contents in Indian soybean<sup>3</sup> and to ascertain their association with physical parameters of seed.

Thirteen promising soybean varieties were obtained from four different agroclimatic locations of Central India namely Rafi Ahmad Kidwai College of Agriculture, Sehore; Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur; Agriculture Research Station, Puwarkheda (District Hoshangabad) and Indira Gandhi Krishi Vishwavidyalaya, Raipur representing Vindhya Plateau, Kymore Plateau and Satpura Hills, Central Narmada Valley and Chhattisgarh Plain agroclimatic regions respectively.

The ash content was determined by ashing<sup>4</sup> the ground soybean at 600°C until a constant weight was obtained whereas the calcium and magnesium were determined by titrimetric methods<sup>5</sup>. The seed density was calculated by taking the ratio of weight and the volume of same quantity of seed and the sphericity

TABLE-1  
TOTAL ASH, CALCIUM, MAGNESIUM, SEED DENSITY AND SPHERICITY OF VARIOUS SOYBEAN VARIETIES FROM DIFFERENT LOCATIONS OF INDIA

Varieties	Total Ash (g per 100 g seed)			Calcium (mg per 100 g of seed)			Magnesium (mg per 100 g of oil)			Seed density (g per mL)			Sphericity												
	Shr	Jbp	Hbd	Rpr	Mean	Shr	Jbp	Hbd	Rpr	Mean	Shr	Jbp	Hbd	Rpr	Mean	Shr	Jbp	Hbd	Rpr	Mean					
JS71-05	4.93	4.74	4.62	4.93	4.81	220	264	230	288	251	246	223	227	244	235	1.179	1.180	1.171	1.129	1.165	0.884	0.855	0.868	0.849	0.864
MACS-58	4.52	4.50	4.60	4.79	4.60	211	230	264	298	251	237	225	227	251	235	1.169	1.167	1.166	1.153	1.164	0.845	0.845	0.855	0.838	0.846
JS81-335	4.80	4.56	4.74	4.87	4.74	222	247	247	283	250	235	219	228	241	231	1.172	1.175	1.167	1.120	1.159	0.862	0.817	0.841	0.817	0.834
JS81-1310	4.72	4.57	4.70	4.84	4.71	228	230	246	279	246	228	221	225	238	228	1.139	1.142	1.137	1.088	1.126	0.803	0.798	0.795	0.790	0.796
PUNJAB-1	4.55	4.50	4.83	4.98	4.72	230	244	239	293	252	223	221	235	240	230	1.209	1.175	1.160	1.076	1.155	0.831	0.833	0.778	0.829	0.818
JS-2	4.63	4.50	4.63	4.76	4.63	232	245	251	287	254	222	221	223	235	225	1.167	1.206	1.180	1.132	1.171	0.870	0.877	0.864	0.851	0.865
JS72-44	4.94	4.31	4.67	4.88	4.70	240	244	223	266	243	231	217	228	225	225	1.154	1.163	1.160	1.130	1.152	0.864	0.813	0.873	0.866	0.854
JS72-280	4.45	4.35	4.75	4.31	4.47	234	228	234	301	249	222	220	237	238	229	1.147	1.184	1.160	1.135	1.157	0.785	0.789	0.810	0.779	0.791
JS75-46	4.74	4.60	4.64	4.91	4.72	237	219	241	297	249	224	229	225	231	227	1.185	1.157	1.173	1.143	1.165	0.847	0.808	0.843	0.836	0.833
MACS-13	4.39	4.45	4.39	4.54	4.44	264	241	248	269	256	221	220	219	242	226	1.186	1.197	1.183	1.112	1.169	0.868	0.813	0.846	0.792	0.830
PK-472	4.53	4.41	4.56	4.58	4.52	215	222	253	234	231	226	221	221	237	226	1.221	1.190	1.270	1.145	1.207	0.836	0.821	0.821	0.821	0.824
JS80-21	4.41	4.26	4.31	4.62	4.40	225	204	263	274	242	225	219	218	241	226	1.174	1.213	1.129	1.121	1.159	0.857	0.843	0.836	0.790	0.831
JS76-205	4.34	4.29	4.23	4.46	4.33	222	190	273	272	239	223	220	217	233	223	1.165	1.148	1.182	1.114	1.152	0.806	0.812	0.773	0.779	0.792
Mean	4.61	4.46	4.59	4.73	4.60	229	231	247	280	247	228	221	225	238	228	1.174	1.177	1.172	1.123	1.162	0.843	0.825	0.831	0.818	0.829
	SEM(L): 0.096 CD(L): 0.227			SEM(L): 14.21 CD(L): 33.40			SEM(L): 4.42 CD(L): 10.39																		
	SEM(V): 0.048 CD(V): 0.086			SEM(V): 7.11 CD(V): NS			SEM(V): 2.21 CD(V): NS																		

Shr-Sehore, Jbp-Jabalpur, Hbd-Hoshangabad, Rpr-Raipur, SEM(L)-Standard Error Mean (Location), SEM(V)-Standard Error Mean (Variety), CD(L)-Critical Difference (Location), CD(V)-Critical Difference (Variety) and NS-Not Significant.

was determined by dividing the greatest dimension of seed to the equivalent diameter (*i.e.*, the cubic root of the product of seed length, width and thickness) of seed<sup>6</sup>. The results are summarized in Table-1.

It was observed that the planting location makes statistically significant effect on total ash, calcium and magnesium contents of soybean seeds whereas the varietal variation makes significant effect only on total ash. The total ash observed was location-wise maximum at Hoshangabad (4.73 g per 100 g seed) and minimum at Sehore (4.46 g per 100 g seed) whereas variety-wise maximum was in JS71-05 (4.81 g per 100 g seed) and minimum was in JS76-205 (4.33 g per 100 g seed). Statistically, the mean values for all the locations and varieties were at par. The maximum calcium content observed was at Raipur (280 mg per 100 g) and minimum was at Sehore (229 mg per 100 g). In context of magnesium content the maximum value observed was at Sehore (238 mg per 100 g) whereas minimum was at Jabalpur (221 mg per 100 g). Statistically all the locations observed were at par for calcium and magnesium contents.

The correlation analysis of these parameters with seed density indicates negative association of seed density with total ash ( $r = -0.37$ ), calcium ( $r = -0.49$ ) and magnesium ( $r = -0.53$ ) whereas the sphericity has got significant association only with total ash ( $r = 0.30$ ).

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