Correlation and path analysis of seed quality characters in soybean

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SUMMARY

Correlation and path analysis of seed quality characters was studied in five soybean cultivars. A great scope for improvement of seed quality was found to exist. The seed vigour characters were found to exhibit positive correlation among themselves but these did not show any association with oil and protein content. Oil content showed positive correlation with protein while protein content showed positive correlation with germination. The path co-efficient analysis showed that moisture content recorded highest and negative direct effect on seed germination percentage. The seed characteristics seed index, processing recovery and oil content had positive direct effect on seed germination though protein content showed negative indirect effect on seed germination.

Key Words : Correlation, Path analysis, Seed index

Soybean [*Glycine max* (L.) Merrill] has emerged as one of the major oilseed crop in India. It is termed as "Miracle Golden of 21st Century" because of its protein content. It has brought revolutionary changes in Indian agriculture. Beside protein it is good source of oil, calcium, iron and vitamins. One of the major obstacle in soybean production is availability of good quality seed. A plant stand of about 4,00,000 is imperative for optimum performance of soybean crop. Seed germinability is ascribable to inherent genetic potential of the variety along with several other factors. It is very important to maintain vigour and viability of seed and to avoid losses at the time of harvest. Pod shattering in soybean production and the extent of yield losses may vary from negligible to 90% depending upon time of harvest, environmental conditions and genetic endowment of variety

(Tiwari and Bhatnagar, 1988). Therefore, of timely harvest of mature seed is important in protecting and maintaining seed quality. The study was undertaken to understand the scope of improvement and interdependence of seed vigour and quality characters in soybean. The present study was hence undertaken with regard to different seed quality characters using some recently evolved strains of soybean.

The experimental material comprised of five recently released soybean cultivars *viz.*, JS-335, JS-93-05, MAUS-71, MAUS-81 and MAUS-158. The experiment was laid out in Factorial Randomized Block Design with three replications at Soybean Research Station Marathwada Agricultural University Parbhani. The seeds were treated with thiram @ 3 g per kg before sowing. The sowing was carried out on 5th July 2008 and all the recommended package of practices were followed. The harvesting and sampling was initiated at physiological maturity and continued at 7 days interval up to 21 days. The seed samples were subjected to various laboratory tests *viz.*, seed moisture at harvest (%), seed index (g), processing recovery (%), protein content (%), oil content (%), seed germination (%), root length (cm), shoot length (cm), seedling fresh weight (g), seedling dry weight (g) and vigour index. The data obtained were subjected to correlation and

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Table 1 : Correlation coefficient among different characters during various stages of seed harvest

Characters	Seed moisture	Seed index	Processing recovery	Oil content	Protein content	Germination
Moisture content	1.000	-0.284	-0.214	-0.327	-0.395	-0.642**
Seed index		1.000	0.679**	0.697**	0.505	0.644**
Processing recovery			1.000	0.542**	0.404	0.671**
Oil content				1.000	0.357	0.606**
Protein content					1.00	0.405

** indicates significance of value at P=0.01

Table 2: Path analysis showing direct (diagonal) and indirect (off diagonal) effect of different characters on germination

Characters	Seed moisture	Seed index	Processing recovery	Oil content	Protein content	Germination
Moisture content	-0.998	0.141	0.106	0.162	0.196	-0.642**
Seed index	-0.052	0.183	0.125	0.128	0.092	0.644**
Processing recovery	-0.087	0.277	0.408	0.221	0.165	0.671**
Oil content	-0.041	0.088	0.068	0.127	0.045	0.606**
Protein content	0.037	-0.048	-0.038	-0.034	-0.095	0.405

** indicates significance of value at P=0.01

path analysis as per Deway and Lu (1959). Oil content in seeds was estimated by nuclear magnetic resonance using NMR model Bruker minispec PC 20 (Wet Germany).

In case of five recently released cultivars different seed characteristics were studied *viz.*, seed moisture content, test weight protein and oil content. The germination percentage depends upon physical and biochemical properties of seed. The study was intended to ascertain the nature of association between germination percentage and seed quality characteristics. The data showed that moisture content had significant and negative correlation with germination percentage. Seed index showed significantly positive correlation with processing recovery, oil content and germination percentage. While oil content showed significant and positive correlation with processing recovery. The attribute moisture content was negatively correlated with all the seed quality characters while seed index showed positive correlation with all the characters (Table 1).

Oil content showed positive correlation with protein content while protein content showed positive correlation with germination. On the contrary protein percentage showed a negative association with seed oil percentage.

The path co-efficient analysis showed that moisture content recorded highest and negative direct effect on seed germination percentage (Table 2). Seed index, processing recovery and oil content showed positive direct effect on seed germination though direct effect of protein content on seed germination was negative. The similar results were reported by Charjan and Tarar (1991), Tiwari and Joshi (1989), Harer and Deshmukh (1992), Ramgiry and Roha (1997) and Gohil *et al.* (2006).

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