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RESEARCH PAPER

Correlation studies between mechanical damage (%) and seed quality parameters in *Kharif* and summer sown soybean [*Glycine max* (L.) Merrill] genotypes

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Abstract **:** An experiment was conducted to evaluvate ninety soybean genotypes in two seasons' *viz*., *Kharif* and summer. In *Kharif* season highly significant positive correlation with seed length (0.423), seed width (0.419), 100 seed weight (0.577) and seed infestation (0.215) was recorded. Whereas, germination percentage (-0.148), seedling vigour index (-0.199) and field emergence (-0.086) showed negative correlation with mechanical damage percentage at non-significant level. In summer season highly significant positive correlation with seed length (0.285) seed width (0.400), hundred seed weight (0.544) and electrical conductivity (0.301) was recorded.

Key Words **:** Correlation, Mechanical damage, Seed quality, Soybean

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INTRODUCTION

Soybean [*Glycine max* (L.) Merrill] is gaining popularity on account of it's unique characteristics and adaptability to varied agro-climatic conditions. It has unmatched composition of 40 per cent protein and 20 per cent oil and nutritional superiority on account of containing essential amino acids, unsaturated fatty acids, carbohydrates, vitamins and minerals. Soybean protein is rich in valuable amino acid lycine (5%) in which most cereals are deficient. In addition, it contains a good amount of minerals, salts and vitamins (thiamine and riboflavin) and its sprouting grains contain a considerable amount of vitamin C. It is a cream-colored oval bean about the size of a common pea. Soybean belongs to the legume family and is native to East Asia. Soya is a frost-sensitive summer annual and plants may reach 1 metre high. Seeds are borne in hairy pods, which grow in clusters of three to five; each pod contains two or three seeds, which resemble peas. It has been an important protein source for millions of people for over five thousand years.

Soybean seed is regarded as a poor storer, generally it losses its viability and vigour readily since it is easily susceptible to mechanical injuries caused during harvest and post harvest operations. Soon after harvest, soybean seed is subjected to several post harvest operations like threshing, drying, grading, transportation and other handling operations. During these operations, soybean is subjected to the mechanical damages /injuries due to susceptibility and breakage of the seed coat and it losses its viability and vigour at a faster rate due to looses of membrane permeability of seeds. In soybean, there are several improved varieties available for commercial cultivation but they are likely to loose viability and vigour more due to differential mode of mechanical forces causing damages and injuries to the seeds.

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Some varieties are known to loose viability and vigour more rapidly. While, some varieties retain their quality for longer time, the research work on the response of various soybean varieties on mechanical damage and seed quality are very scanty and hence it has been investigated.

MATERIALS AND METHODS

An experiment was conducted at College of Agriculture, Dharwad, Karnataka, India during 2009-2010. The field experiment was laid out in the Completely Randomized Block Design with factorial concept and replicated thrice for record of various observations. 90 soybean genotypes were evaluvated in two seasons' *viz.*, *Kharif* and summer. To observe mechanical damage (%) one hundred seeds were drawn from each treatment in three replications. These seeds were soaked in 20 per cent solution of ferric chloride ($FeCl_3$), after the five minutes of soaking, the seeds were removed and individual seeds were observed for their mechanical damage. The seeds with cracks or streaks stained dark green and swelled seeds were separated and recorded as mechanically damaged seeds and expressed in percentage based on number of stained seeds (Mc. Donald, 1985).

RESULTS AND DISCUSSION

The results obtained from the present investigation have been duscussed below:

Kharif:

Mechanical damage percentage showed highly significant positive correlation with seed length (0.423), seed width (0.419), 100 seed weight (0.577) and seed infestation (0.215). Whereas, germination percentage (-0.148), seedling vigour index (-0.199) and field emergence (-0.086) showed negative correlation with mechanical damage percentage at non-significant level while, seed density (0.147), embryo weight (0.136), electrical conductivity (0.170) and reducing sugar (0.044) showed positive correlation at non-significant level (Table 1).

Summer:

Mechanical damage percentage expressed highly significant positive correlation with seed length (0.285) seed width (0.400), hundred seed weight (0.544) and electrical conductivity (0.301). However, field emergence (-0.252) exhibited significant negative correlation with mechanical damage percentage such as seed density (0.170), embryo weight (0.068), seed infestation (0.068) and reducing sugar (0.019) in positive direction germination percentage (0.005) and seedling vigour index (-0.064) (Table 2).

Mechanical damage percentage was positively and significantly associated with seed length, seed width, hundred seed weight and seed infestation. Whereas, none of the

Table 1 : Correlation between mechanical damage (%) and seed quality parameters in *Kharif* sown soybean genotypes

Characters	Seed length (cm)	Seed width (cm)	Seed density (g/cc)	100 seed weight (g)	Embryo weight (g)	Seed infestation (%)	Seed germination (%)	Seedling vigour index	Field emergence (%)	Electrical conductivity (dSm^{-1})	Reducing sugar (%)	Seed mechanical damage (%)
Seed length (cm)	1.000	0.628**	0.049	0.506**	0.142	0.114	0.274**	0.307**	0.275**	0.141	0.051	0.423**
Seed width (cm)		1.000	0.134	0.617**	0.207*	0.258*	0.240*	0.245*	0.336**	0.064	0.077	0.419**
Seed density (g/cc)			1.000	0.277**	0.271**	0.093	0.115	0.122	0.147	0.125	0.091	0.147
100 seed weight (g)				1.000	0.794**	0.207*	0.070	0.113	0.297**	0.065	0.237*	0.577**
Embryo weight (g)					1.000	0.007	0.112	0.167	0.223*	0.240*	0.306**	0.136
Seed infestation (%)						1.000	0.028	0.006	0.049	0.056	0.070	0.215*
Seed germination (%)							1.000	0.975**	0.032	0.758**	0.151	0.148
Seedling vigour index								1.000	0.078	0.761**	0.121	0.199
Field emergence (%)									1.000	0.070	0.187	0.086
Electrical conductivity (dSm^{-1})										1.000	0.052	0.170
Reducing sugar (%)											1.000	0.044
Seed mechanical damage (%)												1.000

* and ** indicate of values at P 0.05 and 0.01, respectively   Other values are non significant

characters such as seed germination, seedling vigour index and field emergence showed significantly negative correlation with mechanical damage in *Kharif* season. Similarly, in summer season, mechanical damage percentage was significantly and positive correlation with seed length, seed width, hundred seed weight and electrical conductivity, whereas field emergence, vigour index expressed significant negative correlation with mechanical damage percentage, similar results were confirmed by Borikar *et al.* (1985) in sorghum.

Table 2 : Correlation between mechanical damage (%) and seed quality parameters in summer sown soybean genotypes

Characters	Seed length (cm)	Seed width (cm)	Seed density (g/cc)	100 seed weight (g)	Embryo weight (g)	Seed infestation (%)	Seed germination (%)	Seedling vigour index	Field emergence (%)	Electrical conductivity (dSm⁻¹)	Reducing sugar (%)	Seed mechanical damage (%)
Seed length (cm)	1.000	0.601**	0.022	0.590**	0.260*	0.023	0.104	0.071	0.151	0.013	0.225*	0.285**
Seed width (cm)		1.000	0.139	0.707**	0.299**	0.115	0.022	0.065	0.159	0.017	0.051	0.700**
Seed density (g/cc)			1.000	0.192	0.194	0.064	0.177	0.129	0.063	0.063	0.044	0.170
100 seed weight (g)				1.000	0.523**	0.175	0.114	0.156	0.276*	0.071	0.155	0.577**
Embryo weight (g)					1.000	0.131	0.074	0.057	0.174	0.126	0.156	0.068
Seed infestation (%)						1.000	0.061	0.042	0.129	0.032	0.113	0.068
Seed germination (%)							1.000	0.965**	0.014	0.519*	0.203	0.005
Seedling vigour index								1.000	0.051	0.585**	0.235*	0.064
Field emergence (%)									1.000	0.213*	0.079	0.252*
Electrical conductivity (dSm⁻¹)										1.000	0.063	0.301**
Reducing sugar (%)											1.000	0.019
Seed mechanical damage (%)												1.000

* and ** indicate significance of values at P 0.05 and 0.01, respectively. Other values are non significant

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