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Impact of seed rate compensation on seed yield and quality of soybean (*Glycine max* (L.) Merrill)

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Abstract
The field experiment was conducted to optimise seed rate through seed rate compensation on growth, seed yield and quality in JS335 and JS9560 soybean varieties during 2017-18 at NSP, University of Agricultural Sciences, Bengaluru. The experimental material for the study comprised of 2 soybean varieties (JS335 and JS9560) procured from NSP. The results revealed that, among the seed rate compensation levels, C_1 recorded higher number of seeds per pod (3.68), number of pods per plant (44.25), seed yield per plant (9.60), seed yield per plot (1.90); germination (96.83%), seedling length (34.54) and seedling dry weight (8.67mg). Among the varieties, V_1 (JS 335) recorded higher number of seeds per pod (2.67), Number of pods per plant (70.52), seed yield per plant (8.95), seed yield per plot (1.51); germination (96.33%), seedling length (31.91) and seedling dry weight (48.23mg). The lowest yield and quality parameter was observed in C_5 (Aged seeds of 50 per cent germination with compensated seed rate, 87.5 kg/ha).

Keywords: Seed rate compensation, seed yield, germination, seed quality

Introduction
Soybean [*Glycine max* (L.) Merrill] is the important economic pulse cum oil seed crop and identified as important grain legume in the world, in view of total production and international trade. It belongs to the family Fabaceae and originated from china and distributed across Asia, USA, Brazil, Argentina etc. Approximately around 85 per cent of the world's soybean processed into vegetable oil and soybean meal. The producers of soybean are USA (36%), Brazil (36%), Argentina (18%), China (5.0%) and India (4.0%). In World, soybean occupies 126.64 million hectare area and production 346.31 million tones and productivity of 2,735 kg per hectare. India occupies 10.56 million hectare area and production of 11.22 million tonnes with productivity of 1,153 kg per hectare (Anon., 2018) [1].

Seed vigour is explained as "the sum total of the attributes of a seed which determines the performance and level of activity of the seed or seed lot during germination and seedling emergence" (ISTA, 2015) [5]. However, seeds lose vigour before they lose ability to germinate. Seeds even with good germination many times record reduced yield due to poor field stand because of its lower seedling vigour. Crop uniformity has been directly related to seed vigor (Cantarelli *et al.*, 2015) [2]. Therefore seed vigour is an important attribute for a seed quality to be considered, since the vigorous seeds will produce uniform and vigorous seedlings even under sub-optimal field conditions which ultimately give higher yield (Delouche, J. C. and Baskin, C. C., 1973) [4].

Since the seed rate of soybean is high and it loses its viability and vigour at faster rate due to its delicate seed coat, seed rate compensation is an method for the farmers to use the saved seeds for sowing to compensate the germination and yield as well. Seed with good germination but of low vigour may reduce field stand, growth and yield which could be overcome by seed rate compensation. But proper adjustment in seed rate may be essential. So, the famers who have been discriminating with regard to use of high quality seed are now becoming more aware of the immense benefits of using high vigour seeds as planting material.

Materials and Methods
The field experiment was conducted to optimise seed rate through seed rate compensation on growth, seed yield and quality in JS335 and JS9560 soybean varieties during 2017-18 at NSP, University of Agricultural Sciences, Bengaluru. The material for the study comprised of 2 soybean varieties (JS335 and JS9560) procured from NSP. The soybean varieties were sown in randomized complete factorial design during 2017-18 Kharif seasons. Each variety was sown in a single row of 3 meters length with a row spacing of 0.45 m and 0.2 m between plants

within a row. The experiment comprised 2 factors,
Factor-1: Varieties (V), V_1- JS335 and V_2- JS 9560
Factor-2: Seed rate compensation (C)

C_1: Seeds of 70 per cent germination with normal seed rate (62.5 kg / ha)
C_2: Aged seeds of 65 per cent germination with compensated seed rate (67.3 kg / ha)
C_3: Aged seeds of 60 per cent germination with compensated seed rate (72.9 kg / ha)
C_4: Aged seeds of 55 per cent germination with compensated seed rate (79.5 kg / ha)
C_5: Aged seeds of 50 per cent germination with compensated seed rate (87.5 kg /ha)

The observations on number of seeds per pod, number of pods per plant, seed yield per plant, seed yield per plot and quality parameters like germination, seedling length and seedling dry weight were recorded.

Results and Discussion
Among the seed rate compensation and varieties, C_1 and V_1 (JS335) recorded higher number of seeds per pod, number of pods per plant, seed yield per plant, seed yield per plot; germination, seedling length and seedling dry weight. The lowest yield and quality parameter was observed in C_5 (Aged seeds of 50 per cent germination with compensated seed rate, 87.5 kg /ha). Yield and quality parameter differed significantly with Varieties and Seed rate compensation (C) (Table 1 and 2).

The yield and quality parameters declined significantly with the loss in viability and vigor. High vigor seeds (C_1) showed highest number of seeds per pod (3.68), number of pods per plant (44.25), seed yield per plant (9.60 g), seed yield per plot (1.90 kg), germination (96.33%), seedling length (34.54 cm) and seedling dry weight (48.72 mg) followed by C_2.

Low vigor seeds i.e. C_5 showed lowest number of seeds per pod (2.10), number of pods per plant (63.00), seed yield per plant (7.72 g), seed yield per plot (0.9 kg), germination (89.67%), seedling length (28.05 cm) and seedling dry weight (47.03 mg) followed by C_4.

Among the interaction, V_1 C_1 recorded the highest number of seeds per pod (3.67), number of pods per plant (46.70), seed yield per plant (9.87), seed yield per plot (2.00), germination (98.00%), seedling length (35.00 cm) and seedling dry weight (48.77 mg) and the lowest number of seeds per pod (2.10), number of pods per plant (61.33), seed yield per plant (7.53 g), seed yield per plot (0.93 kg), germination (89.00%), seedling length (27.17 cm) and seedling dry weight (47.73 mg) recorded by V_2 C_5

Table 1: Effect of seed rate compensation on number of seeds per pod, number of pods per plant, seed yield per plant (g) and seed yield per plot (kg)

Treatments	Number of seeds per pod	Number of pods per plant	Seed yield per plant (g)	Seed yield per plot (kg)
Varieties (V)				
V_1 - JS 335	2.67	40.52	8.95	1.51
V_2 – JS 9560	3.09	35.65	8.34	1.33
S.Em+	0.11	1.28	0.16	0.03
CD (P = 0.05)	0.33	3.83	0.47	0.10
Seed rate compensation (C)				
C_1	3.68	44.25	9.60	1.9
C_2	3.27	40.67	9.21	1.66
C_3	2.92	38.17	8.65	1.4
C_4	2.43	34.33	8.05	1.16
C_5	2.10	33.00	7.72	0.9
S.Em+	0.17	2.03	0.25	0.05
CD (P = 0.05)	0.51	6.05	0.75	0.15
Interaction (V X C)				
V_1 C_1	3.67	46.70	9.87	2.00
V_1 C_2	2.90	43.20	9.67	1.83
V_1 C_3	2.50	41.37	8.96	1.50
V_1 C_4	2.20	36.67	8.33	1.27
V_1 C_5	2.10	34.67	7.90	0.93
V_2 C_1	3.70	41.80	9.33	1.80
V_2 C_2	3.63	38.13	8.74	1.50
V_2 C_3	3.33	34.97	8.33	1.30
V_2 C_4	2.67	32.00	7.77	1.07
V_2 C_5	2.10	31.33	7.53	0.97
S.Em+	0.24	2.87	0.36	0.07
CD (P = 0.05)	0.73	8.56	1.06	0.22
CV (%)	14.80	7.30	7.12	8.97

Table 2: Effect of seed rate compensation on seed germination (%), seedling length (cm) and mean seedling dry weight (mg)

Treatments	Seed germination (%)	Seedling length (cm)	Mean seedling dry weight (mg)
Varieties (V)			
V_1 - JS 335	94.87	31.91	48.23
V_2 – JS 9560	92.53	30.84	47.89
S.Em+	0.62	0.23	0.12
CD (P = 0.05)	1.84	0.67	NS
Seed rate compensation (C)			
C_1	96.83	34.54	48.72
C_2	95.67	33.00	47.96
C_3	93.83	31.52	47.77
C_4	92.50	29.78	47.88

C_5	89.67	28.05	47.03
S.Em+	0.97	0.36	0.18
CD (P = 0.05)	2.90	1.06	0.55
Interaction (V X C)			
$V_1 C_1$	98.00	35.00	48.77
$V_1 C_2$	97.33	33.57	48.33
$V_1 C_3$	95.00	31.93	48.11
$V_1 C_4$	93.67	30.13	48.03
$V_1 C_5$	90.33	28.93	47.92
$V_2 C_1$	95.67	34.07	48.66
$V_2 C_2$	94.00	32.43	47.59
$V_2 C_3$	92.67	31.10	47.43
$V_2 C_4$	91.33	29.43	48.03
$V_2 C_5$	89.00	27.17	47.73
S.Em+	1.38	0.50	0.26
CD (P = 0.05)	4.11	1.50	NS
CV (%)	2.54	2.78	1.45

Yield components such as, number of seeds per pod, number of pods per plant, seed yield per plant, seed yield per plot reduced linearly and significantly with decrease in vigor levels with compensated seed rate. The reduction in number of pods per plant could be due to translocation of reserve food materials to the developing pods will be restricted by the low vigour seeds compared to high vigour seeds. The results are in conformity with Manjunath (1993) [8] in Maize that the poor crop growth fails to translocate the assimilates to the growing tissues.

These could be due to the poor performance of emerged plants from low vigor seeds as they loss the carbohydrates, proteins (Venkatesh Rao, 1990 [10] in sorghum and Manjunath Swamy, 1994 [8] in maize).

These indicate that, the decrease in yield and quality parameter was due to loss in seed vigor. The reduction in the quality parameters could be due to loss of cell membrane integrity which leads to loss of sugars, amino acids and proteins. These results are in confirmatory with Thimmanna (1993) [11] in soybean and Krishnamurthy (1996) [6] in field bean.

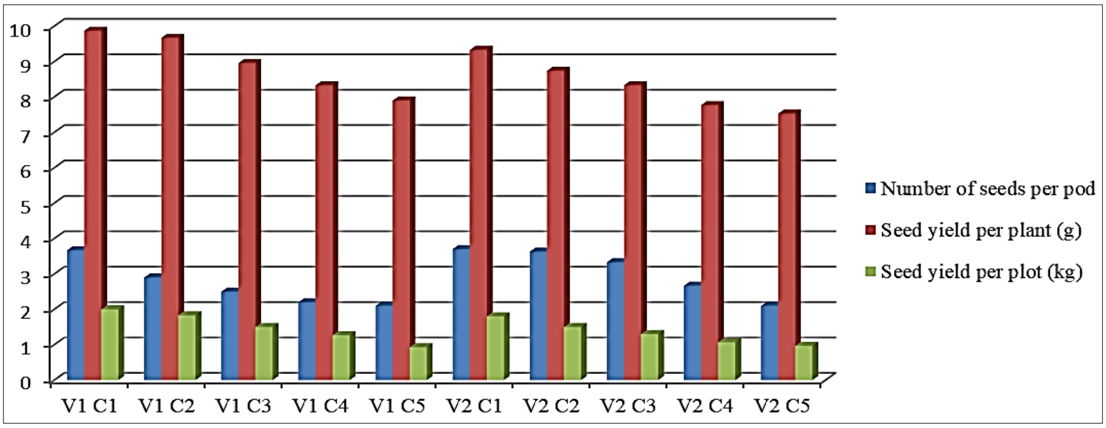

Fig 1: Influence of seed rate compensation on number of seeds per pod, seed yield per plant (g) and seed yield per plot (kg)

The reduction in the yield of low vigor seeds could be attributed to loss of carbohydrates and proteins which fail to supply reserve food materials as energy to the emerged plants. The reduction in number of pods per plant could be due to translocation of reserve food materials to the developing pods will be restricted by the low vigour seeds compared to high vigour seeds (Narayanaswamy, 1996 in field bean) [9]. The results are in conformity with Manjunath (1993) [8] in Maize that the poor crop growth fails to translocate the assimilates to the growing tissues.

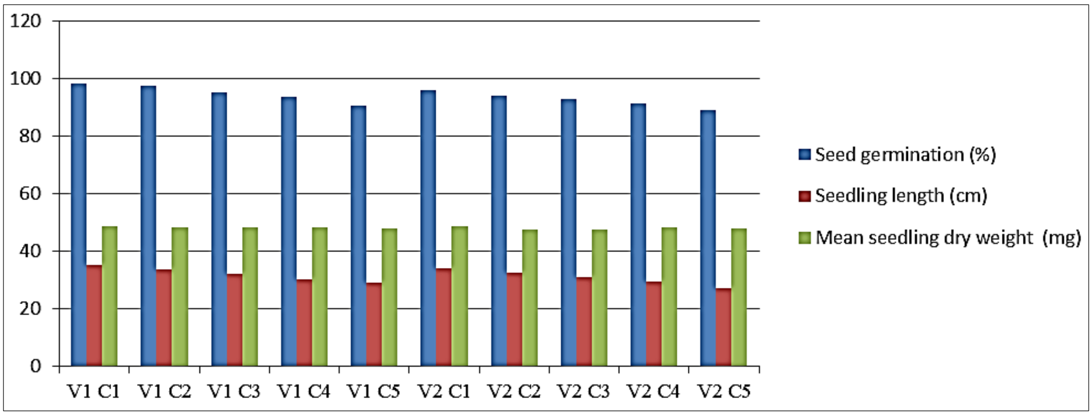

Fig 2: Influence of seed rate compensation on germination (%), seedling length (cm) and mean seedling dry weight (mg)

The reduction in the germination, seedling length and seedling dry weight could be attributed by loss of cell membrane integrity which leads to loss of sugars, amino acids and proteins and might be due to reduced seed weight in turn less availability of stored products in less vigour seeds and also poor seed development which resulted in decreased seed weight due to insufficient accumulation and translocation of photosynthates the from source to sink as compared to high vigour seeds. These findings are in agreement with those of earlier researchers by Kurdikeri, 1992 [7].

It is not advisable to compensate the seed rate of vigor levels whose germination falls to 60% and below. It is advisable to compensate the seed rate of vigor levels whose germination is 65% and above.

References

1. Anonymous., Directorate of Economics and Statistics, Department of Agriculture and Cooperation. Govt of India 2018, P127-129.
2. Cantarelli LD, Schuch LOB, Tavares LC, De Cassyo AR. Variability of soybean plants originated from seeds with different levels of physiological quality. Acta Agron 2015, P234-238.
3. Caverzan A, Rafael G, Mariele Muller, Cristian Biazus, Nadia Canali Langaro, Geraldo Chavarria. How Does Seed Vigor Affect Soybean Yield Components. Crop Ecology and Physiol 2018;10(4):1-12.
4. Delouche JC, Baskin CC. Accelerated ageing techniques for predicting the relative storability of seed lots. Seed Sci Technol 1973;1(3):427-452.
5. ISTA. International rules for seed testing. International Seed Testing Association, Basserdorf, Switzerland 2015.
6. Krishnamurthy. Influence of seed vigour levels and seed rate compensation on seed yield and quality in field bean, M.Sc. (Agri) Thesis, Univ Agric Sci, Bangalore, Karnataka, India 1996.
7. Kurdikeri. Studies on seed quality in hybrid maize, Ph.D Thesis, Univ Agric Sci, Bangalore, Karnataka, India 1992.
8. Manjunath Swamy. Effect of seed vigour levels on field performance and yield of TMV-2 groundnut. M.Sc. (Agri) Thesis, Univ Agric Sci, Bangalore, Karnataka, India 1994.
9. Narayanaswamy S. Influence of seed vigour levels and seed rate compensation on seed yield and duality in field bean. M.Sc. (Agri) Thesis, Univ Agric Sci, Bangalore, Karnataka, India 1996.
10. Venkatesh Rao. Studies on the relationship between levels of germination and storability growth and yield in sorghum yield in sorghum hybrids. M.Sc. (Agri) Thesis, Univ Agric Sci, Bangalore, Karnataka, India 1990.
11. Thimmanna. Studies on Seed vigour levels and seed rate compensation in soybean, M.Sc. (Agri) Thesis, Univ Agric Sci, Bangalore, Karnataka, India 1994.