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ASSESSMENT OF SEED QUALITY PARAMETERS OF MUNGBEAN UNDER INTEGRATED NUTRIENT MANAGEMENT IN MOLLISOLS

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ABSTRACT

A field and laboratory experiment was carried out at G.B. Pant University of Agriculture and Technology, Pantnagar, India, during *kharif* 2020 to evaluate seed quality parameters of mungbean. Treatments comprised of selected combinations of varying doses of fertilizer nutrients (N, P_2O_5 and K_2O) with and without FYM. Results revealed improvement in majority of seed quality parameters including 100 seed weight, germination (%), shoot length (cm), root length (cm), seedling length (cm seedling^{-1}), seedling dry weight (mg seedling^{-1}), seedling vigour index I, seedling vigour index II under 20 kg N ha^{-1} with FYM @ 10 t ha^{-1}, 75 kg P_2O_5 ha^{-1} with FYM @ 10 t ha^{-1} and 30 kg K_2O ha^{-1} with FYM @ 5 t ha^{-1} out of the varying doses of N, P_2O_5 and K_2O (keeping other two nutrients doses constant in the combination). Consequently, the use of suitable combination of fertilizer nutrients integrated with FYM may be advantageous for producing better quality seeds of mungbean along with an overall improvement of crop yield.

Key words : Seed quality, Mungbean, Nitrogen, Phosphorus, Potassium, FYM.

Introduction

Mungbean (*Vigna radiata* L.) is regarded as a primitive leguminous crop cultivated widely in South East Asia. It is also known as green gram and belongs to the family leguminosae. Among the various pulse crops grown in India, the total coverage under mungbean is about 46 Lha with a production of 24 Lt with a substantial rise in acreage of mungbean from 2015-16 onwards (Directorate of Pulses Development, Annual report 2021-22). It is a nutritionally superior, short duration, dual purpose crop (forage and seed) with multitude of nutritional benefits. Its seeds comprise of 22-28% protein, 60-65% carbohydrates, 1-1.5% fats, 3.5-4.5% ash (El Karamany, 2006). In addition to being nutritionally rich, seeds of mungbean are found more palatable, digestible and non-flatulent compared to other pulses and considered as a good substitute for animal protein providing balanced nutrition when consumed with cereals (Delice *et al.*, 2011). Being leguminous in nature, it also under goes biological fixation of nitrogen to sustain soil fertility for succeeding crops. Furthermore, it can thrive on marginal lands where other crops perform poorly (Dainavizadeh and Mehranzadeh, 2013).

The use of good quality seed, better fertilizer management, and the availability of irrigation facilities are 3 key components to sustain agricultural productivity. Higher quality seeds acts as the foundation for successful seed production programme which in turn allows uniform germination and faster development of root and shoot, accounting for 25-30% of the overall yield improvement (National food Security Mission, 2010). While fertilizer application had a huge impact towards ensuring higher yield since the green revolution era, its balanced usage with organic sources of nutrients may not only improve physico-chemical properties of soil but may also improve seed quality and quantity (Kishor *et al.*, 2021). Keeping in mind the above, a laboratory study was performedto evaluate different seed quality parameters of mungbean undervarying levels of fertilizer nutrient with and without FYM to deduce suitable doses of nitrogen, phosphorus and potassium with or without the integration of organic sources of nutrient for improving seed quality in mungbean.

Materials and Methods

Description of study area

A field experiment was conducted during *kharif* 2020 at N.E.B, C.R.C., G.B. Pant University of Agriculture and Technology. The experimental field comprised of *Mollisols*, identified as *coarse-loamy, mixed, hyperthermic* family of *Typic Hapludoll* (Despande *et al*., 1971). Initial soil sample analysis showed low plant available nitrogen with medium available phosphorus and potassium, respectively. Soil had a slightly acidic pH with negligible salinity.

Description of experiment

Prior to evaluation of seed quality parameters a fertilizer prescription equation was developed for mungbean in *Mollisols* centered on soil test crop response (STCR) approach. The experiment based on the guidelines of AICRP on STCR was divided into two components: (a) development of soil fertility gradient (*rabi* 2019-20), where artificial soil fertility gradient by dividing the field into 3 same sized plots and applying graded levels of nitrogen, phosphorus and potassium over which exhaust crop, wheat (*var.* HD2967) was grown and (b) main (test crop) experiment in which fertility gradient plots were split into 72 subplots and mungbean (*var.* Pant Mung-5) was sown as main cropand its seeds were treated with *Rhizobium*. Before sowing of mungbean varying levels of nitrogen (0, 10, 20 and 30 kg N ha^{-1}), phosphorus (0, 25, 50 and 75 kg P_2O_5 ha^{-1}), potassium (0, 15, 30 and 45 kg K_2O ha^{-1}) and FYM (0, 5, 10 t ha^{-1}) were applied on the subplots and crop response was observed to develop site specific fertilizer prescription equation for mungbean.

After harvesting of crop at maturity, corresponding seed material was collected from subplots and used to evaluate different seed quality parameters. Those subplots were chosen whose treatment combinations consisted of different levels of nitrogen, phosphorus and potassium, respectively with medium dose of other two nutrients as constant in the treatment combination andintegrated with no FYM, FYM @ 5 t ha^{-1} and @ 10 t ha^{-1} (Table 1). The seeds of chosen treatment combination were then analysed for seed quality parameters in the laboratory. Methodology for assessment of various seed quality parameters are elaborated as follows:

(a) 100 seed weight : After threshing and winnowing, random seed samples of 100 seeds were taken from each treatment in four replications. Weight of 100 seeds (in g) was measured using weighing balance.

Table 1 : Selected treatment combinations of fertilizer nutrients with and without FYM for seed quality evaluation in mungbean.

Nitrogen	Phosphorus	Potassium
$N_0P_{50}K_{30}$ FYM_0	$N_{20}P_0K_{30}$ FYM_0	$N_{20}P_{50}K_0$ FYM_0
$N_0P_{50}K_{30}$ FYM_5	$N_{20}P_0K_{30}$ FYM_5	$N_{20}P_{50}K_0$ FYM_5
$N_0P_{50}K_{30}$ FYM_{10}	$N_{20}P_0K_{30}$ FYM_{10}	$N_{20}P_{50}K_0$ FYM_{10}
$N_{10}P_{50}K_{30}$ FYM_0	$N_{20}P_{25}K_{30}$ FYM_0	$N_{20}P_{50}K_{15}$ FYM_0
$N_{10}P_{50}K_{30}$ FYM_5	$N_{20}P_{25}K_{30}$ FYM_5	$N_{20}P_{50}K_{15}$ FYM_5
$N_{10}P_{50}K_{30}$ FYM_{10}	$N_{20}P_{25}K_{30}$ FYM_{10}	$N_{20}P_{50}K_{15}$ FYM_{10}
$N_{20}P_{50}K_{30}$ FYM_0	$N_{20}P_{50}K_{30}$ FYM_0	$N_{20}P_{50}K_{30}$ FYM_0
$N_{20}P_{50}K_{30}$ FYM_5	$N_{20}P_{50}K_{30}$ FYM_5	$N_{20}P_{50}K_{30}$ FYM_5
$N_{20}P_{50}K_{30}$ FYM_{10}	$N_{20}P_{50}K_{30}$ FYM_{10}	$N_{20}P_{50}K_{30}$ FYM_{10}
$N_{30}P_{50}K_{30}$ FYM_0	$N_{20}P_{75}K_{30}$ FYM_0	$N_{20}P_{50}K_{45}$ FYM_0
$N_{30}P_{50}K_{30}$ FYM_5	$N_{20}P_{75}K_{30}$ FYM_5	$N_{20}P_{50}K_{45}$ FYM_5
$N_{30}P_{50}K_{30}$ FYM_{10}	$N_{20}P_{75}K_{30}$ FYM_{10}	$N_{20}P_{50}K_{45}$ FYM_{10}

Where; N, P and K: N, P_2O_5 and K_2O, respectively.

(b) Seed germination : Four replications of 50 treated seeds (with thiram) were placed in a petri dish and incubated at 25±2°C and 90±2% R.H. Seedlings were evaluated on 8th day according to standard procedure for germinationas described (ISTA, 1993).

Germination (%) =

$$\frac{Total\ number\ of\ normal\ seedlings}{Total\ number\ of\ seeds\ taken\ for\ observation} \times 100$$

(c) Shoot, root and seedling length : Five seedlings were chosen at random from each treatment on 8th day after removing cotyledon and separating root and shoot of seedlings. Root and shoot length of each seedling was measured using meter scale. Seedling length was calculated by taking the sum of root and shoot length (mean value reported in cm seedling^{-1}).

(d) Seedling dry weight : Seedlings used for length measurement were utilized to measure seedling dry weight. Seedlings were oven-dried at 70±2°C for 72 hours or till the weight became constant. Mean dry weight of seedlings reported in mg seedling^{-1}.

(e) Seedling vigour index : Seedling vigour index was calculated using formula (Abdul-Baki and Anderson, 1973):

Seedling vigour index I = Germination (%) × Seedling length (cm seedling^{-1})

Seedling vigour index II = Germination (%) × Seedling dry weight (mg seedling^{-1})

Statistical analysis

Data recorded from laboratory experiment were analyzed using completely randomized design (C.R.D.) according to procedures by Gomez and Gomez (1984) using software MS Excel 2013, OPSTAT and STPR-3. The experiment consisted of 12 treatments per nutrient, replicated four times. Overall significance of treatment differences were evaluated by 'F' test and treatment means compared using critical difference (C.D.) at 5% level of significance.

Results

The data revealed significant difference in 100 seed weight, germination percent, shoot length, root length, seedling length, seedling dry weight, seedling vigour index I and seedling vigour index II (Tables 2, 3 and 4).

Effect of fertilizer nitrogen with and without FYM

The 100 seed weight of mungbean was found significantly higher with treatments N_{20} P_{50} K_{30} FYM_{10}, N_{10} P_{50} K_{30} FYM_{10}, $N_{30}P_{50}K_{30}FYM_{10}$ and $N_{20}P_{50}K_{30}FYM_{5}$ (4.08, 4.07, 4.06 and 4.03 g, respectively), when compared to remaining treatments. While only $N_{20}P_{50}K_{30}FYM_{10}$ resulted significantly higher germination percent compared to $N_{20}P_{50}K_{30}FYM_{5}$ and $N_{30}P_{50}K_{30}FYM_{10}$. Significantly higher shoot length (6.58 cm) was observed when nitrogen level comprised of $N_{30}P_{50}K_{30}FYM_{5}$ against remaining treatments except $N_{30}P_{50}K_{30}FYM_{10}$, $N_{20}P_{50}K_{30}FYM_{10}$ and $N_{30}P_{50}K_{30}FYM_{0}$. $N_{30}P_{50}K_{30}FYM_{10}$ and $N_{30}P_{50}K_{30}FYM_{5}$ resulted in significantly higher root length (6.01 and 5.87 cm, respectively) compared to rest treatments. Treatments $N_{30}P_{50}K_{30}FYM_{10}$ and $N_{30}P_{50}K_{30}FYM_{5}$ were significantly superior to remaining treatments for seedling length (12.51 and 12.45 cm, respectively) in terms of different nitrogen levels. Significantly higher seedling dry weight (0.122 mg) was observed under $N_{20}P_{50}K_{30}FYM_{10}$ when compared to other treatments. Significantly higher seedling vigour index I (1138, 1115, 1101 and 1090) was observed in treatments comprising of $N_{30}P_{50}K_{30}FYM_{10}$, $N_{20}P_{50}K_{30}FYM_{10}$, $N_{30}P_{50}K_{30}FYM_{5}$ and $N_{20}P_{50}K_{30}FYM_{5}$, respectively against other treatments. Meanwhile, only $N_{20}P_{50}K_{30}FYM_{10}$ recorded significantly higher seedling vigour index II (11.41) compared to other treatments.

Effect of fertilizer phosphorus with and without FYM

The 100 seed weight of mungbean was found significantly higher with treatment $N_{20}P_{75}K_{30}FYM_{10}$ and $N_{20}P_{25}K_{30}FYM_{10}$ (4.21 and 4.20 g, respectively), compared to remaining treatments. Significantly higher germination percent (93.50, 93.50, 92.50 and 92.50) was observed with $N_{20}P_{75}K_{30}FYM_{10}$, $N_{20}P_{50}K_{30}FYM_{10}$, $N_{20}P_{75}K_{30}FYM_{5}$ and $N_{20}P_{50}K_{30}FYM_{5}$, respectively compared to other treatments. Treatments $N_{20}P_{75}K_{30}FYM_{10}$ and $N_{20}P_{75}K_{30}FYM_{5}$ resulted significantly higher shoot length compared to remaining treatments of phosphorus except $N_{20}P_{75}K_{30}FYM_{0}$ and $N_{20}P_{50}K_{30}FYM_{10}$. Significantly higher root length (6.15 and 6.05 cm) was observed in treatment $N_{20}P_{75}K_{30}FYM_{10}$ and $N_{20}P_{75}K_{30}FYM_{5}$, respectively compared to rest treatments. Seedling length was found to be significantly superior with treatment $N_{20}P_{75}K_{30}FYM_{10}$ and $N_{20}P_{75}K_{30}FYM_{5}$ (12.74 and 12.62 cm, respectively), compared to all other treatments. Treatments

Table 2 : Effect of fertilizer nitrogen with and without FYM on seed quality parameters of mungbean.

Treatments	100 seed weight (g)	Germination (%)	Shoot length (cm)	Root length (cm)	Seedling length (cm seedling^{-1})	Seedling dry weight (mg seedling^{-1})	Seedling vigour index I	Seedling vigour index II
$N_0P_{50}K_{30}FYM_0$	3.43	86.00	4.79	4.76	9.55	0.104	821	8.90
$N_0P_{50}K_{30}FYM_5$	3.55	87.50	5.00	4.93	9.93	0.107	868	9.36
$N_0P_{50}K_{30}FYM_{10}$	3.82	89.00	5.14	5.07	10.21	0.110	909	9.79
$N_{10}P_{50}K_{30}FYM_0$	3.53	86.50	5.45	5.09	10.54	0.105	911	9.08
$N_{10}P_{50}K_{30}FYM_5$	3.76	88.50	5.76	5.14	10.89	0.109	964	9.65
$N_{10}P_{50}K_{30}FYM_{10}$	4.07	89.50	5.98	5.16	11.14	0.113	997	10.11
$N_{20}P_{50}K_{30}FYM_0$	3.85	89.00	6.08	5.35	11.42	0.117	1017	10.37
$N_{20}P_{50}K_{30}FYM_5$	4.03	92.50	6.35	5.43	11.78	0.118	1090	10.91
$N_{20}P_{50}K_{30}FYM_{10}$	4.08	93.50	6.44	5.48	11.92	0.122	1115	11.41
$N_{30}P_{50}K_{30}FYM_0$	3.83	87.00	6.38	5.53	11.91	0.107	1036	9.31
$N_{30}P_{50}K_{30}FYM_5$	3.88	88.50	6.58	5.87	12.45	0.112	1101	9.87
$N_{30}P_{50}K_{30}FYM_{10}$	4.06	91.00	6.50	6.01	12.51	0.115	1138	10.42
S.E.m±	**0.028**	**1.15**	**0.076**	**0.077**	**0.116**	**0.0009**	**16.02**	**0.147**
C.D. (5%)	**1.49**	**2.57**	**2.59**	**2.88**	**2.08**	**0.002**	**3.21**	**2.95**

Table 3 : Effect of fertilizer phosphorus with and without FYM on seed quality parameters of mungbean.

Treatments	100 seed weight (g)	Germination (%)	Shoot length (cm)	Root length (cm)	Seedling length (cm seedling^{-1})	Seedling dry weight (mg seedling^{-1})	Seedling vigour index I	Seedling vigour index II
$N_{20}P_0K_{30}$ FYM_0	3.57	86.00	4.71	4.54	9.25	0.105	795	9.03
$N_{20}P_0K_{30}$ FYM_5	3.71	87.00	5.07	5.05	10.12	0.107	880	9.31
$N_{20}P_0K_{30}$ FYM_{10}	4.13	88.00	5.18	5.08	10.26	0.108	903	9.51
$N_{20}P_{25}K_{30}$ FYM_0	3.78	87.00	5.54	5.13	10.67	0.111	928	9.66
$N_{20}P_{25}K_{30}$ FYM_5	4.06	88.00	5.81	5.19	11.00	0.113	968	9.90
$N_{20}P_{25}K_{30}$ FYM_{10}	4.20	89.50	5.98	5.29	11.27	0.115	1008	10.30
$N_{20}P_{50}K_{30}$ FYM_0	3.85	89.00	6.08	5.35	11.42	0.117	1017	10.37
$N_{20}P_{50}K_{30}$ FYM_5	4.03	92.50	6.35	5.43	11.78	0.118	1090	10.91
$N_{20}P_{50}K_{30}$ FYM_{10}	4.08	93.50	6.44	5.48	11.92	0.122	1115	11.41
$N_{20}P_{75}K_{30}$ FYM_0	3.85	89.50	6.53	5.56	12.09	0.120	1082	10.74
$N_{20}P_{75}K_{30}$ FYM_5	3.92	92.50	6.57	6.05	12.62	0.122	1168	11.29
$N_{20}P_{75}K_{30}$ FYM_{10}	4.21	93.50	6.60	6.15	12.74	0.125	125	11.69
S.E.m±	**0.017**	**0.842**	**0.071**	**0.101**	**0.132**	**0.001**	**17.10**	**0.138**
C.D. (5%)	**0.049**	**2.42**	**0.204**	**0.290**	**0.380**	**0.003**	**49.04**	**0.395**

Table 4 : Effect of fertilizer potassium with and without FYM on seed quality parameters of mungbean.

Treatments	100 seed weight (g)	Germination (%)	Shoot length (cm)	Root length (cm)	Seedling length (cm seedling^{-1})	Seedling dry weight (mg seedling^{-1})	Seedling vigour index I	Seedling vigour index II
$N_{20}P_{50}K_0$ FYM_0	3.54	86.00	4.67	4.58	9.25	0.107	795	9.20
$N_{20}P_{50}K_0$ FYM_5	3.74	87.50	5.02	4.84	9.86	0.109	862	9.54
$N_{20}P_{50}K_0$ FYM_{10}	3.82	88.50	5.20	5.07	10.27	0.110	909	9.69
$N_{20}P_{50}K_{15}$ FYM_0	3.72	87.00	5.25	5.17	10.42	0.112	906	9.74
$N_{20}P_{50}K_{15}$ FYM_5	3.83	88.00	5.48	5.25	10.72	0.113	943	9.94
$N_{20}P_{50}K_{15}$ FYM_{10}	3.91	89.50	5.53	5.31	10.83	0.114	969	10.21
$N_{20}P_{50}K_{30}$ FYM_0	3.85	89.00	6.08	5.35	11.42	0.117	1017	10.37
$N_{20}P_{50}K_{30}$ FYM_5	4.03	92.50	6.35	5.43	11.78	0.118	1090	10.91
$N_{20}P_{50}K_{30}$ FYM_{10}	4.08	93.50	6.44	5.48	11.92	0.122	1115	11.41
$N_{20}P_{50}K_{45}$ FYM_0	3.82	91.00	6.11	5.32	11.43	0.119	1040	10.79
$N_{20}P_{50}K_{45}$ FYM_5	3.90	91.50	6.17	5.47	11.64	0.120	1065	10.93
$N_{20}P_{50}K_{45}$ FYM_{10}	4.12	92.50	6.25	5.64	11.89	0.122	1100	11.29
S.E.m±	**0.019**	**1.06**	**0.11**	**0.09**	**0.139**	**0.001**	**17.06**	**0.160**
C.D. (5%)	**0.055**	**3.05**	**0.317**	**0.259**	**0.399**	**0.003**	**49.14**	**0.461**

$N_{20}P_{75}K_{30}FYM_{10}$ recorded significantly higher dry weight of seedling (0.125 mg) except treatments $N_{20}P_{75}K_{30}FYM_5$ and $N_{20}P_{50}K_{30}FYM_{10}$. Treatments $N_{20}P_{75}K_{30}FYM_{10}$ and $N_{20}P_{75}K_{30}FYM_5$ noted significantly higher seedling vigour index I of 1191 and 1168, respectively compared to remaining treatments. Significantly higher seedling vigour index II of 11.69 was observed with $N_{20}P_{75}K_{30}FYM_{10}$ in comparison to other treatments with respect to phosphorus levels.

Effect of fertilizer potassium with and without FYM

The 100 seed weight was found significantly higher in treatment $N_{20}P_{50}K_{45}FYM_{10}$ (4.12 g) than rest treatments except $N_{20}P_{50}K_{30}FYM_{10}$ (4.08 g) with different potassium levels. Significantly higher germination percent was found in treatment $N_{20}P_{50}K_{30}FYM_{10}$ compared to rest potassium treatments except $N_{20}P_{50}K_{30}FYM_5$, $N_{20}P_{50}K_{45}FYM_{10}$, $N_{20}P_{50}K_{45}FYM_5$ and $N_{20}P_{50}K_{45}FYM_0$. Significantly higher shoot length was found in treatment $N_{20}P_{50}K_{30}FYM_{10}$ compared to other treatments except $N_{20}P_{50}K_{30}FYM_{5}$ $N_{20}P_{50}K_{45}FYM_{10}$ and $N_{20}P_{50}K_{45}FYM_{5}$. Significantly higher root length was found in treatment $N_{20}P_{50}K_{45}FYM_{10}$ (5.64 cm) compared to rest treatments except $N_{20}P_{50}K_{30}FYM_{10}$, $N_{20}P_{50}K_{45}FYM_{5}$ and $N_{20}P_{50}K_{30}FYM_{5}$. Seedling length was found to be significantly higher in treatment $N_{20}P_{50}K_{30}FYM_{10}$ than other treatments of potassium levels except $N_{20}P_{50}K_{45}$ FYM_{10}, $N_{20}P_{50}K_{30}FYM_{5}$ and $N_{20}P_{50}K_{45}FYM_{5}$. Treatments $N_{20}P_{50}K_{45}FYM_{10}$ and $N_{20}P_{50}K_{30}FYM_{10}$ recorded significantly higher dry weight of seedling compared to other treatments except $N_{20}P_{50}K_{45}FYM_{5}$. Significantly higher S.V.I. I was found in treatment $N_{20}P_{50}K_{30}FYM_{10}$ in comparison to all other treatments except $N_{20}P_{50}K_{45}FYM_{10}$ and $N_{20}P_{50}K_{30}FYM_{5}$. Treatments significantly higher S.V.I. II of 11.41 was found in treatment $N_{20}P_{50}K_{30}FYM_{10}$, when compared to other treatments except $N_{20}P_{50}K_{45}FYM_{10}$.

Discussion

Seed quality parameters improved with integration of organic manures and fertilizers. Findings were in conformity with Mor *et al.* (2019) in wheat. The improved seed quality in integrated combinations may be accounted to well-filled seeds with accumulation of higher quantities of seed constituents under better nutrients supply (Raissi *et al*., 2012).

Test weight is a component of sink of the crop. Significant increase in 100 seed weight with nitrogen application was also suggested by Yin *et al.* (2018) and Demeke *et al.* (2020) in mungbean. Besides, phosphorus application stimulates crop growth along with dry matter production, leading to improved photosynthate translocation and sink development resulting in higher 100 seed weight (Karnavat *et al*., 2018). It also boosts nitrogenase activity of root nodules and prolongs crop maturity, having an impact on test weight in pulses (Sonet *et al*., 2020). Ram and Dixit (2001) and Hussen *et al.* (2020) also observed higher test weight @ 60 kg P_2O_5 ha^{-1}. Shariff *et al.* (2017) noted significantly higher seed weight with application of organic manure. The rise in 100 seed weight with the application of organic manure may be attributed to proliferation of beneficial microbial population due to organic manure, increasing the availability of nitrogen for crop growth causing higher seed weight (De Britto and Girja, 2006).

Significantly higher germination percent at higher fertilizer nutrient level along with co-inoculation of biofertilizer were reported by Amruta *et al.* (2016) in black gram, which may be accounted to the presence of more metabolites in seeds, aiding in the resurgence of embryonic development during germination. Besides, integration of inorganic and organic fertilizers results in accumulation of more food reserves in seeds and availability of adequate nutrients right from fertilization until maturity may also be responsible for enhancing seed germination (Kumar *et al.*, 2019).

Shrimal and Khan (2017) also noted higher dry weight, root length and shoot length with increased organic manure application in bengal gram. Vigour index of seed improves *via*. transformation of macromolecules into micromolecules as a consequence of release of enzymes by metabolites (Anitha *et al*., 2015). Increase in seedling vigour index I and II in the presence of higher fertilizer nutrient with biofertilizers was also reported by Muthu *et al.* (2017) in mungbean and Amruta *et al.* (2016) in black gram.

Conclusion

Based on the findings, improvement in majority of seed quality parameters of mungbean with varying dose of nutrients (keeping other two nutrients doses constant) was observed with 20 kg N ha^{-1} with FYM @ 10 t ha^{-1}, 75 kg P_2O_5 ha^{-1} with FYM @ 10 t ha^{-1} and 30 kg K_2O ha^{-1} with FYM @ 5 t ha^{-1}. Thus, conjunctive usage of fertilizer nutrients along with FYM may be suggested obtaining higher seed quality parameters in mungbean, leading to an overall improvement in crop yield.

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