

Original Research Article

Effect of FYM, Phosphorus and PSB on growth, yield attributes, yield and economics of Mungbean (*Vigna radiata* (L.) Wilczek).

Abstract

A field experiment was carried out for two consecutive years (2020 and 2021) during the *Kharif* season at the Student's Instructional Farm (SIF) of Chandra Shekhar Azad University of Agriculture & Technology, Kanpur (Uttar Pradesh) India. The main objective was to find out the effect of FYM, phosphorus levels, and PSB on the growth and yield of the *Kharif* Mungbean. Mungbean variety Shweta (K.M. 2241) was sown in Randomized Block Design with a factorial arrangement and replicated thrice. There were twenty treatment combinations. The levels of FYM were: control (F₀), 1.0 t (F₁), 2.0 t (F₂), and 3.0 t (F₃), and levels of phosphorus were: PSB only (P₁), 20 kg P₂O₅ (P₂), 20 kg P₂O₅ + PSB (P₃), 40 kg P₂O₅ (P₄) and 40 kg P₂O₅ + PSB (P₅). The FYM, phosphorus, and PSB were applied as per treatment. The maximum growth attribute and number of pods per plant (14.70), pod weight/plant (7.44 g), test weight (41.36 g), seed yield (894 kg/ha), gross income (Rs 68744 /ha), net income (Rs 40790.8 /ha) and B: C ratio (2.46) were recorded with (F₃) 3t FYM/ha. As regards the phosphorus levels, it also improved growth, yield attributes, and yield of *Kharif* Mung. The maximum number of pods per plant (13.99), pod weight/ plant (6.57 g), test weight (40.85 g), seed yield (825 kg/ha), gross income (Rs 63431.25 /ha), net income (Rs 35191.50/ha and B: C ratio (2.23) were recorded with the application of (P₅) 40 kg P₂O₅ /ha + PSB.

Keywords: *Mungbean, FYM, PSB, Phosphorus, Yield, Economics.*

1. INTRODUCTION

Mungbean [*Vigna radiata* (L.) Wilczek] is one of the important pulse crops grown in the arid and semi-arid regions of India. Mungbean stands third after chickpea and pigeon pea among pulses (Joshi & Saxena 2002). It is a short duration *kharif* pulse crop which can also be grown as catch crop between *rabi* and *kharif* seasons. It is fairly tolerant to drought and can be grown successfully on well drained loamy to sandy loam soil in areas of erratic rainfall. During summer, it can also be used as a green manure crop. Being a leguminous crop, it has the capacity to fix atmospheric nitrogen. Its green plants are used as fodder after removing the mature pods. Mungbean is an excellent source of protein (25%) with high quantity of lysine (4600 mg/g N) and tryptophan (60 mg/g N) and consumed as whole grain as well as *dal* in different ways for table purposes (Bhavya *et al.*, 2018). India is the largest producer, consumer and importer of pulses in the world. India produces 25% of the global pulses production. It consumes 27% of the total world consumption of pulses and also largest importer (14%) of pulses in the world. In India, Mungbean occupies 34.37 lakh ha area and contributes to 17.83 lakh tonnes in pulse production (Anonymous, 2019-20). The important Mungbean growing states in India are Rajasthan, Maharashtra, Karnataka, Madhya Pradesh, Gujrat, Tamil Nadu and Uttar Pradesh. In, Uttar Pradesh the total area under Mungbean was 0.49 lakh ha with the annual production of 0.14 lakh tonnes (Anonymous, 2019-20). In India, the mixed farming system with livestock raising is

an integral part of crop production, which is an economic enterprise under existing conditions (Gill, *et al.*, 2009). The availability of large quantity of FYM being rich in organic matter necessitates the need for supplementing with the fertilizers. Green manuring seems to be difficult under intensive cropping system so, recycling of different organic wastes in the form of compost would also be the good source of organic manures. Among organic manures, FYM is rich in organic matter and is a good source of plant nutrients. On decomposition, it produces organic acids and carbon-dioxide, which help to dissolve minerals and make them more available to the growing plants. It helps to buffer soils against rapid chemical changes. FYM also acts as a source of energy for the growth of soil microbes. It improves the physical, chemical and biological conditions of the soil. Improvement in physical properties of the soil, organic carbon and available nitrogen, phosphorus and potassium has been well documented by Babulkar *et al.*, (2000) due to long term application of FYM and fertilizers. Application of FYM to farm crops also avoids its wasteful use for burning purposes. Indian soils have poor to medium status in available phosphorus. Phosphorus is immobile in soil system and hardly 15-20 % of the applied P is utilized by a crop to which it is applied. While, the rest remains in a fixed state in soil being influenced by various physico-chemical and biological properties of the soil (Sammauria *et al.* 2020). In addition to P solubilization, these micro-organisms can mineralize organic P into a soluble form. These reactions take place in the rhizosphere and because the micro-organisms render more P into solution than is required for their own growth and metabolism, the surplus is available for plants to absorb. Normally, these bacteria can solubilize about 15-20 kg P₂O₅ ha⁻¹ per season and inoculation was found to increase the crop yield of by 10-20 % (Gangasuresh *et al.*, 2010). Phosphorus (P) is one of the major essential elements required for the growth and development of the plants. P is present in both organic and inorganic form in the soil. Plants generally take up P in inorganic form (H₂PO₄⁻, HPO₄²⁻) from soil solution (Hocking, 2001). Some growth factors/processes associated with P in plants are seed germination, cell division, stem strength, flowering, fruiting, crop quality, synthesis of starch & fat and many biochemical activities. In leguminous crops, P promotes root nodulation, nitrogen fixation, nutrient use efficiency, efficient partitioning of photosynthesis between source and sink, and biomass production (Rao, 2009). The chemical fertilizers, no doubt, are important source which can meet the nutrient requirement but their imbalance and continuous use has led to environmental pollution and deterioration of physico-chemical properties of the soil. Furthermore, availability of fertilizer at economic prices is another problem for the farmers. Under these circumstances, a system comprising balanced use of fertilizer along with multinutrient organic manures and low cost bio fertilizer needs to be evolved. At present soil health is a serious problem in agriculture. It is going to reduce day by day due to continuous use of chemicals in crops and no use of organic manures in soil as well as no inclusion of pulse crops in system, while pulses are very helpful to maintain the soil health and productivity with sustainable production. FYM is a good source of plant nutrients having growth enhancing substances and a number of beneficial micro-organisms like nitrogen fixing; P solubilizing and cellulose decomposing, thus FYM could be added advantageous in crop production. Application of phosphorus increase grain yield of pulse crops by promoting growth and hardiness to shoot, seed quality, regulate photosynthesis and also development of roots and nodulation. The PSB also enhances the availability of phosphorus from the soil into soluble form thus make available to plant. Keeping the above facts in view, the present investigation was planned and carried out at the SIF of C.S. Azad University of Agriculture and Technology, Kanpur during *kharif* seasons of 2020 and 2021 with the following objectives: to study the effect of FYM on growth, yield attributes and yield of Mungbean, to find

out the effect of phosphorus with PSB on growth, yield attributes and yield of Mungbean, to see the interaction effect of the treatments, to work out the economics of the treatment.

2. MATERIALS AND METHODS

A field experiments were carried out at the Student's Instructional Farm of C.S. Azad University of Agriculture and Technology, Kanpur during *kharif* season of 2020 and 2021. The experimental field was well leveled with good drainage system and was irrigated with tube well. Geographically Kanpur is situated at 25.26- 28.58 °N latitude and 79.31- 80.34 °E longitude with an altitude of 125.9 meter above the mean sea level in the central part of Uttar Pradesh, India. The soil samples from the experimental area were collected from 0 to 15 cm soil depth randomly from various places before basal fertilizer and FYM application in both the year of experimentation after thoroughly mixing of these samples and respective soil sample was taken and physio-chemical analysis was done in laboratory. The results obtained from analytical work are as follows *i.e.* Soil texture was Sandy loam, Soil pH (7.7, 7.8), EC ds/m (0.33, 0.33), Organic Carbon % (0.41, 0.42), Available N (Kg/ha) (184.5, 186.0), Available P (Kg/ha) (16.53, 16.9), and Available K (Kg/ha) (149.36 151.3) for 2020 and 2021 respectively. The data on weather conditions that prevailed during the crop season of both years at the meteorological observatory located at the Student's Instructional Farm as the total rainfall received during crop season was 374.7 mm and 333.2 mm in 2020 and 2021, respectively. The weekly mean maximum and minimum temperature during the crop season ranged from 32.3 - 35.1 °C and 20.6 - 27.8 °C in 2020 and 31.5 - 34.5 °C and 22.7 - 27.6 °C in 2021, respectively. The average relative humidity ranged from 33.92 % in 2020 and 45.73 % in 2021. The experiment was laid out in Factorial Randomized Block Design with three replications. In all twenty treatment combinations of two factors (FYM, Phosphorus and PSB) with 4 and 5 levels were tested during both years. Factor A - Levels of FYM (t ha⁻¹) - 4 F₀- Control, F₁ - 1.0, F₂ - 2.0, F₃ - 3.0, Factor B – Levels of phosphorus (kg ha⁻¹) - 5 P₁ - PSB only, P₂ - 20 kg P₂O₅, P₃ - 20 kg P₂O₅ +PSB, P₄ - 40 kg P₂O₅, P₅- 40 kg P₂O₅ +PSB. With Net plot size of 3.60 m x 2.60 m = 9.36 m². Where, shweta variety of Mungbean was selected for experiment during both years. It is a short duration variety developed by C.S. Azad University of Agriculture & Technology, Kanpur in 2013. It is short stature, yielding (10-12 q/ha) with shining seeds and greenish appearance, matures in 60-65 days. Crop was sown in lines 45 cm apart with plant to plant distance of 10 cm using 15 kg ha⁻¹ seed.

The dry matter accumulation was recorded from five plant sampled from third row of each plot leaving 0.5 m row length both side as border. Plant was uprooted as whole and cut close to the ground surface the sampled plants were dried and after that placed in hot air oven at 60 °C till constant weight, from the point of recorded dry weight of plants under different treatments. The dry matter per plant was divided by 5 to get dry weight/plant. Nodules collected from five sample plants were dried in open for two days and transferred to oven at 65 °C for 36 hours and weight of nodules was recorded and averaged. Total number of branches was counted on tagged plants and average number of branches per plant was calculated. Yield attribute *viz.* Total number of pods was counted on tagged plants and averaged for number of pods/plant. Total pods were collected from five tagged plants, weighted and averaged for recording mean pod weight per plant. Five pods were selected at random from each plot. Seeds of such pods were separated and counted in each case. Mean values were recorded as number of seeds/ pod

from different treatments. Five plants were selected at random from each plot and weight of such plants and average weight of seed/plant was recorded. One thousand grain from each sample were collected at the time of threshing, counted and weighted from the point of view to record thousand grain weight. Before threshing, bundle weight of crop produce in each net plot was taken with the help of spring dial balance. The figures were converted into kg/ha. After winnowing and cleaning, seed produce of each net plot was weighed on digital balance in kg which was computed into kg/ha. Grain yield from each net plot was subtracted from the biological yield to get Stover yield per net plot in kg and converted into kg/ha. Harvest index each the percent contribution of grain yield in total biological yield which was computed as under: The common cost of cultivation of Mungbean was worked out at first considering prevailing market rates of different inputs and operations. The cost of treatments estimated separately. Cost of each treatment was added to common cost and thus total cost of cultivation each treatment was worked out. It was recorded in Rs/ha. The income received from grain and straw produce of each treatment added together to get gross income under different treatments, it was calculated from MSP for current year for grain and local market price for stover. Cost of cultivation of each treatment was subtracted from gross income of respective treatments and Figures so obtained were recorded as net profit. The total gross return was divided by total cost of cultivation to get return per rupee of investment.

The data recorded on different crop characters during two years of experimentation were subjected to statistical analysis. Year wise analysis was done as suggested by (Gomez and Gomez 1984) and subsequently pooled over years after testing the homogeneity of error variances of two years. Statistical analysis was done with the help of window-based SPSS (Statistical Product and Service Solutions) Version 10.0, SPSS, Chicago, IL Software on computer.

$$\text{Harvest index} = \frac{\text{Grain yield}}{\text{Biological yield}} \times 100$$

3. RESULT AND DISCUSSION

3.1 Growth Attributes

The data regarding plant population as influenced was non-significant by different doses of FYM and Phosphorus and PSB but numerically influenced under different doses of FYM, Phosphorus and PSB are summarized in Table 1. during both the years and pooled. However, higher plant per running meter was recorded at 40 kg P₂O₅ + PSB in both the years and pooled. However the interaction effect of FYM levels and Phosphorus levels and PSB was also non-significant. It might be due to fact that the experimental crop was shown with uniform seed rate at uniform row spacing under same climatic condition. Similar finding supported by (Keerthi *et al.*, 2015) and (Rekha *et al.*, 2018). The data regarding Dry weight (g) at Maturity as influenced was significantly affected by different doses of FYM and Phosphorus and PSB as presented in Table 1 however FYM and phosphorus levels and PSB the interaction effect was not found significant. At maturity stage significantly higher dry matter/plant was produced in 3t FYM/ha (11.59 g) which was at par with 2t FYM/ha but significantly superior over 1 t FYM/ha and control. Similar Finding was reported by (Katara *et al.*, 2022). At maturity data indicated that highest dry matter accumulation/plant (11.31 g) was noted in 40 kg P₂O₅/ha + PSB which was at par with 40 kg P₂O₅/ha alone but significantly superior over 20 kg P₂O₅/ha + PSB, 20 kg P₂O₅/ha and PSB alone in both the years

and pooled basis. It might be due to favorable condition for regulating the metabolic and enzymatic process in plants as stated by (Aslam *et al.*, 2010), (Chesti *et al.*, 2012), (Verma *et al.*, 2017), (Patel *et al.*, 2018). It is clear from the data recorded at maturity regarding number of branches/plant was influenced significantly under different treatments of FYM and different levels of phosphorus and PSB Table 1 however interaction effect was non-significant. The highest number of branches/plant was recorded with the application of FYM 3t/ha (4.95) which was significantly superior to rest of the treatments. It is also clear that application of 2t FYM/ha was also significantly superior than 1t/ha FYM and control. Similar Finding are also reported by (Choudhary *et al.*, 2011), (Hossain *et al.*, 2018). Where significantly highest number of branches/plant at maturity was recorded in 40 kg P₂O₅ + PSB (4.52) which was at par with 40 kg P₂O₅/ha as alone and 20 kg P₂O₅/ha + PSB but significantly superior over 20 kg P₂O₅/ha and PSB alone. This might be due to application of higher doses of FYM which provide favorable condition for growth and development. The results was supported by (Ehsan *et al.*, 2017), (Kumar & Yadav, 2018) (Kumar *et al.*, 2022). Dry weight of nodules/plant (g) among the different levels of FYM and phosphorus and PSB increased under 60 DAS was influenced significantly however interaction effect of different levels of FYM and phosphorus and PSB was found non-significant. With the highest dry weight of nodules was recorded at application of 3t FYM/ha (14.34 g) at 60 DAS which was significantly superior over rest of the treatment in both the years and pooled basis. Similar finding also conforms with (Choudhary *et al.*, 2011), (Malik *et al.*, 2014), (Sutrisno & Yusnawan, 2018). Where with phosphorus and PSB the highest dry weight of nodules was recorded at application of 40 kg P₂O₅/ha + PSB (13.42 g) under 60 DAS which was significantly superior than rest of the treatments. It is also clear from the data that different doses of phosphorus with PSB increased dry weight of nodules/plant as compare to alone application of phosphorus in both the years and pooled basis at 60 DAS. The highest dry weight of nodules/plant might be due to favorable condition provided by FYM which increased the dry weight of nodules as stated by (Singh *et al.*, 2010), (Mahetele *et al.*, 2011), Tagore *et al.*, 2013), (Rathour *et al.*, 2015).

3.2 Yield attribute

Data presented in Table 2 shows that number of Pods/Plant, weight of pod/plant (g), Number of seed/pod, weight of seed/plant (g) and Test Weight (g) among the different levels of FYM and phosphorus and PSB increased significantly however interaction effect of different levels of FYM and phosphorus and PSB was found non-significant. The data showed that maximum number of Pods/Plant (14.70), weight of pod/plant (7.44 g), Number of seed/pod (9.62), weight of seed/plant (4.01g) and Test Weight (41.36g) were recorded at 3t/ha FYM which was significantly superior than other levels of FYM and control in both the years and pooled basis. It is also clear from the data that increasing doses of FYM increased number of Pods/Plant, weight of pod/plant (g), Number of seed/pod, weight of seed/plant (g) and Test Weight (g) as compared to control. Similar Finding also reported by (Rahman *et al.*, 2008), (Kumawat *et al.*, 2010), (Choudhary *et al.*, 2011), (Yadav *et al.*, 2021), (Choudhary *et al.*, 2022). However data showed that significantly highest number of Pods/Plant (13.99), weight of pod/plant (6.57g), Number of seed/pod (8.82), weight of seed/plant (3.68g) and Test Weight (40.85g) was counted with application of 40 kg P₂O₅ + PSB which was significantly superior than other doses of P₂O₅ + PSB except 40 kg P₂O₅/ha applied as alone which was at par. It is also clear from the data that combine application of phosphorus with PSB increased number of Pods/Plant, weight of pod/plant (g), Number of seed/pod, weight of seed/plant (g) and Test Weight (g) as compare to phosphorus applied as alone. The increase might be due to application of higher doses of FYM and phosphorus & PSB which provide favorable condition for growth and better development of plant which increases overall growth attributes by increasing favorable condition for regulating the metabolic and enzymatic process in plants. The finding supported by (Kumawat *et al.*, 2009), Pir *et al.*, 2009), (Singh *et al.*, 2018), (Singh *et al.*, 2022).

3.3 Yield

The data presented in Table 3 showed that Seed Yield (kg ha^{-1}), Stover Yield (kg ha^{-1}), Biological Yield (kg ha^{-1}), and Harvest Index (%) was influenced significantly under different doses of FYM and phosphorus and PSB however interaction effect was non-significant. Significantly highest Seed Yield (894 kg ha^{-1}), Stover Yield (1486 kg ha^{-1}), Biological Yield (2371 kg ha^{-1}), and Harvest Index (37.65%) was recorded with the application of 3t/ha FYM which was significantly superior than lower doses of FYM and control on pooled basis. Similar findings were also reported by (Kumawat *et al.*, 2010), (Rekha *et al.*, 2018), (Choudhary *et al.*, 2022), (Kumar *et al.*, 2022). However with the application of levels of phosphorus and PSB influenced significantly which increased in Seed Yield (825 kg ha^{-1}), Stover Yield (1351 kg ha^{-1}), Biological Yield (2171 kg ha^{-1}), and Harvest Index (37.98%) was recorded with the application of 40 kg P_2O_5 + PSB which was significantly superior than rest of the treatment on pooled basis. It may be due to favourable condition provided by higher dose of FYM and phosphorus and PSB which increased the better growth and development of crop with better yield attributes. Thus increase in overall yield. Similar findings was reported by (Malik *et al.*, 2013), (Singh *et al.*, 2018), (Rekha *et al.*, 2018), (Sharma *et al.*, 2021).

3.4 Economics

The data presented in Table 4 showed that cost of cultivation (Rs ha^{-1}), gross income (Rs ha^{-1}), net income (Rs ha^{-1}) and B:C ratio under different level of FYM and Phosphorus and PSB. Highest cost of cultivation (27955 Rs ha^{-1}), gross income (68744 Rs ha^{-1}), net income (40790 Rs ha^{-1}) and B:C (2.46) ratio was calculated under 3 t FYM/ha which was highest followed by 2 t/ha FYM while the minimum cost of cultivation was calculated under control in both the years and pooled basis. This may be due to higher effect of FYM and over all yield of crop. Similar findings were also reported by (Singh *et al.*, 2011), (Jat *et al.*, 2014), (Kishor *et al.*, 2021) (Gurjar *et al.*, 2022). However effect of Phosphorus and PSB showed increase the cost of cultivation (28292 Rs ha^{-1}), gross income (63431 Rs ha^{-1}), net income (35191 Rs ha^{-1}) and B:C (2.23) ratio with the application of 40 kg P_2O_5 /ha + PSB followed by 40 kg P_2O_5 alone, 20 kg P_2O_5 /ha + PSB, 20 kg P_2O_5 alone while the minimum was calculated in PSB alone in both the years and pooled basis. Overall the B:C ratio determines the effectiveness of treatment. The increase in net income and B:C ratio might be due to more output as compare to input over rest of the treatment. Similar findings were supported by (Meena *et al.*, 2015), (Singh *et al.*, 2018), (Kumar & Yadav, 2018), (Teja *et al.*, 2022).

Table -1 Effect of FYM and Phosphorus level on growth attribute of Mungbean.

Treatment	Plant population per running meter			Dry weight (g) at Maturity			No. of branches/plant at maturity			Dry weight of nodules/plant (g) at 60 DAS		
	2020	2021	Pooled	2020	2021	Pooled	2020	2021	Pooled	2020	2021	Pooled
Level of FYM t ha⁻¹												
F₁ - 0 t ha⁻¹	10.86	10.99	10.93	10.41	10.52	10.47	3.90	3.91	3.91	11.91	11.99	11.95
F₂ - 1 t ha⁻¹	10.66	11.00	10.83	10.93	11.04	10.99	4.18	4.15	4.16	12.79	12.76	12.77
F₃ - 2 t ha⁻¹	10.73	10.86	10.80	11.17	11.30	11.23	4.48	4.47	4.48	13.27	13.26	13.27
F₃ - 3 t ha⁻¹	10.60	10.99	10.88	11.49	11.69	11.59	4.94	4.96	4.95	14.34	14.34	14.34
SEd ±	0.254	0.306	0.199	0.139	0.173	0.103	0.082	0.099	0.063	0.169	0.196	0.128
CD at 5%	N.S.	N.S.	N.S.	0.281	0.351	0.203	0.166	0.200	0.125	0.342	0.396	0.253
Level of Phosphorus												
P₁- PSB	10.50	10.91	10.71	10.70	10.85	10.77	4.14	4.15	4.15	12.63	12.69	12.66
P₂- 20 Kg P₂O₅	10.75	10.75	10.75	10.94	11.09	11.02	4.36	4.35	4.35	12.85	12.76	12.80
P₃ -20 Kg P₂O₅+ PSB	10.75	11.00	10.87	11.01	11.13	11.07	4.39	4.39	4.39	13.06	13.17	13.11
P₄- 40 Kg P₂O₅	10.66	10.99	10.83	11.15	11.21	11.18	4.47	4.46	4.46	13.42	13.42	13.42
P₅- 40 Kg P₂O₅+ PSB	10.92	11.17	11.04	11.20	11.41	11.31	4.52	4.51	4.52	13.43	13.41	13.42
SEd ±	0.284	0.342	0.222	0.155	0.173	0.115	0.092	0.110	0.071	0.189	0.219	0.143
CD at 5%	N.S.	N.S.	N.S.	0.314	0.351	0.227	0.185	0.223	0.140	0.382	0.443	0.282

Table- 2 Effect of FYM and Phosphorus level on yield attributes of Mungbean.

Treatment	Number of Pods/Plant			Weight of pod/plant (g)			Number of seed/pod			Weight of seed/plant (g)			Test weight (g)		
	2020	2021	Pooled	2020	2021	Pooled	2020	2021	Pooled	2020	2021	Pooled	2020	2021	Pooled
Level of FYM t ha⁻¹															
F ₁ - 0 t ha ⁻¹	11.64	11.75	11.70	4.54	4.54	4.55	7.58	7.63	7.60	2.76	2.75	2.76	40.12	40.13	40.13
F ₂ -1 t ha ⁻¹	13.49	13.58	13.54	4.63	5.60	5.62	7.93	7.93	7.93	3.13	3.15	3.14	40.29	40.30	40.30
F ₃ - 2 t ha ⁻¹	13.94	14.10	14.02	6.44	6.42	6.43	8.49	8.50	8.50	3.61	3.62	3.62	40.73	40.75	40.74
F ₃ - 3 t ha ⁻¹	14.54	14.86	14.70	7.46	7.43	7.44	9.62	9.62	9.62	4.01	4.01	4.01	41.35	41.36	41.36
SEd ±	0.188	0.198	0.135	0.170	0.185	0.124	0.163	0.179	0.120	0.041	0.052	0.033	0.113	0.087	0.071
CD at 5%	0.381	0.401	0.267	0.344	0.375	0.246	0.330	0.363	0.237	0.083	0.106	0.065	0.228	0.175	0.140
Level of Phosphorus															
P ₁ - PSB	12.85	12.98	12.91	5.31	5.32	5.31	7.94	8.01	7.97	2.99	2.99	2.99	40.30	40.31	40.31
P ₂ - 20 Kg P ₂ O ₅	13.06	13.19	13.13	5.84	5.82	5.83	8.24	8.26	8.25	3.28	3.28	3.28	40.58	40.59	40.59
P ₃ -20 Kg P ₂ O ₅ + PSB	13.54	13.73	13.63	6.07	6.03	6.05	8.40	8.40	8.40	3.39	3.40	3.40	40.64	40.65	40.65
P ₄ - 40 Kg P ₂ O ₅	13.68	13.88	13.78	6.29	6.27	6.28	8.62	8.62	8.62	3.55	3.55	3.55	40.76	40.78	40.77
P ₅ - 40 Kg P ₂ O ₅ + PSB	13.89	14.10	13.99	6.58	6.55	6.57	8.82	8.81	8.82	3.68	3.68	3.68	40.84	40.86	40.85
SEd ±	0.210	0.221	0.151	0.190	0.207	0.139	0.182	0.201	0.134	0.046	0.059	0.037	0.126	0.097	0.079
CD at 5%	0.426	0.448	0.299	0.384	0.419	0.275	0.369	0.406	0.265	0.093	0.119	0.072	0.255	0.196	0.167

Table- 3 Effect of FYM and Phosphorus level on yield of Mungbean.

Treatment	Seed Yield (kg ha ⁻¹)			Stover Yield (kg ha ⁻¹)			Biological Yield (kg ha ⁻¹)			Harvest Index (%)		
	2020	2021	Pooled	2020	2021	Pooled	2020	2021	Pooled	2020	2021	Pooled
Level of FYM t ha⁻¹												
F ₁ - 0 t ha ⁻¹	615	616	616	1023	1030	1027	1638	1646	1642	37.54	37.41	37.47
F ₂ - 1 t ha ⁻¹	697	701	699	1195	1163	1179	1885	1864	1874	36.98	37.60	37.29
F ₃ - 2 t ha ⁻¹	825	793	809	1394	1335	1365	2219	2144	2182	37.15	37.70	37.43
F ₃ - 3 t ha ⁻¹	996	891	894	1499	1473	1486	2392	2354	2371	37.44	37.85	37.65
SEd ±	1.79	2.08	1.35	2.88	3.35	2.18	3.33	3.76	2.48	0.070	0.084	0.055
CD at 5%	3.63	4.20	2.68	5.82	6.78	4.32	6.73	7.62	4.91	0.141	0.170	0.110
Level of Phosphorus												
P ₁ - PSB	665	666	666	1141	1138	1139	1805	1791	1798	36.85	37.17	37.01
P ₂ - 20 Kg P ₂ O ₅	734	712	723	1248	1221	1234	1982	1953	1967	37.03	37.47	37.25
P ₃ -20 Kg P ₂ O ₅ + PSB	766	761	764	1298	1258	1278	2060	2019	2039	37.21	37.69	37.45
P ₄ - 40 Kg P ₂ O ₅	799	790	795	1337	1298	1318	2136	2088	2112	37.40	37.82	37.61
P ₅ - 40 Kg P ₂ O ₅ + PSB	828	823	825	1366	1337	1351	2184	2159	2171	37.89	38.06	37.98
SEd ±	2.01	2.32	1.51	3.22	3.75	2.44	3.72	4.21	2.77	0.078	0.094	0.062
CD at 5%	4.06	4.70	3.00	6.51	7.59	4.83	7.53	8.52	5.49	0.158	0.190	0.123

4. CONCLUSION

It can be concluded from the above study that effect of FYM and Phosphorus level on Mungbean has better effect on growth, yield attributes, yield and economics of Mungbean. With treatment F_3 - 3 t ha⁻¹ FYM has better growth, yield attributes, yield and economics of Mungbean as compared to other treatment with FYM and Control. However with Phosphorus level treatment P_5 - 40 Kg P₂O₅+ PSB has better effect on growth, yield attributes, yield and economics of Mungbean.

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