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VARIETAL EFFECT WITH DIFFERENT DOSES OF PHOSPHORUS FERTILIZER ON THE YIELD AND YIELD CONTRIBUTING CHARACTERS OF WINTER MUNGBEAN

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ABSTRACT

Islam MR, Islam N, Sarkar MAR, Zaman F, Islam AKMM, Kato-Noguchi H (2014) Varietal effect with different doses of phosphorus fertilizer on the yield and yield contributing characters of winter mungbean. *Int. J. Sustain. Crop Prod.* 9(2), 38-46.

The experiment was conducted to study the effect of variety with different level of phosphorus fertilizers on the growth parameters and seed yield of winter mungbean during November 2010 to March 2011 in the Agronomy Field Laboratory, Bangladesh Agricultural University, Mymensingh. Four varieties of mungbean *viz.* BINA Mung-1, BINA Mung-3, BARI Mung-4 and BARI Mung-5 and four levels of phosphorus *viz.* 0, 12, 25 and 35 kg P ha^{-1} were used in the experiment. The experiment was laid out in randomized complete block design (RCBD) with three replications. Results revealed that among the variety BARI Mung-5 the highest number of pods $plant^{-1}$(20.45), mature pods $plant^{-1}$ (14.97), pod length (5.49 cm), number of seeds pod^{-1} (17.78), seed weight $plant^{-1}$ (29.49 g), 1000 seeds weight (40.68 g), straw yield (3.00 t ha^{-1}), biological yield (4.34 t ha^{-1}), harvest index (36.06%) and seed yield (1.34 t ha^{-1}). Among the phosphorus level, the highest number of pods $plant^{-1}$ (19.52), pod length (5.64 cm), number of seeds pod^{-1} (16.41), weight of 1000seeds (39.39 g), harvest index (35.94%), straw yield (2.99 t ha^{-1}) and seed yield (1.32 t ha^{-1}) were obtained from the application of 25 kg P ha^{-1}. The interaction effect showed, BARI Mung-5 fertilized with 25kg P ha^{-1} gave highest result in all growth parameters and seed yield (1.34 t ha^{-1}). It was observed that increase level of phosphorus fertilizer exhibited an increase in number of seed $plant^{-1}$ and reached the maximum at 25kg P ha^{-1} and further increase of phosphorus did not increase the seed number $plant^{-1}$. Further higher dose of phosphorus decreased the values of all yield contributing characters and seed yield. It is concluded that BARI Mung-5 fertilized with 25 kg P ha^{-1} gave the highest number of pods $plant^{-1}$ (20.98), pod length (6.30 cm) and seed yield (1.44 t ha^{-1}) compared with other treatments and it may be recommended.

Key words: *mungbean, variety, phosphorus, growth, seed yield*

INTRODUCTION

Pulse is an excellent source of dietary proteins. Pulses can play a significant role to meet up the food shortage, widespread malnutrition and considered as the poor men's meat as it is the cheapest source of protein (Mian 1976 and Kaul 1982). In Bangladesh, daily per capita consumption of pulses is only 13.29 g (BBS 2011), while the World Health Organization (WHO) of United Nations (UN) recommended 45 g per day per capita for a balance diet (BARI 1982). Mungbean (*Vigna radiata*) is an important pulse crop of global economic importance. Mungbean contains 51% carbohydrate, 26% protein, 10% moisture, 4% minerals and 3% vitamins (Kaul 1982) and best compare to other pulses due to its high nutritive value, digestibility and non-flatulent behavior. In Bangladesh total production of mungbean in 2010-2011 was 19,000 metric ton from an area of 68,000 acres (BBS 2011) and average yield of mungbean is lower than that of other countries due to the use of local varities by farmers. The agro-ecological condition of Bangladesh is favorable for growing this crop. This crop is usually grown with residual soil moisture in Bangladesh. It is cultivated both in summer and winter season in many pulse growing countries in the world (Bose 1982). When grown in rainy season, the vegetative growth becomes excessive with the formation of less number of pods and seeds. The average yield of mungbean cultivar in our country is poor compared to the yield of other countries. But there is a great opportunity to replace the local mungbean varieties with modern high yielding varieties of mungbean. The farmers of Bangladesh generally grow mungbean by one ploughing but use almost less fertilizer due to their poor socio-economic condition. Fertilizer recommendation for soils and crops is a dynamic process in view of the generation of the new knowledge, changes in soil nutrient status, changes in plants and planting patterns and associated management practices (Asaduzzaman *et al*. 2008). Optimum time of planting of mungbean may vary with varieties and seasons due to the variation in agro-ecological conditions. The optimum rate of phosphorus fertilization to get maximum yield is also an important factor. Mungbean is highly responsive to fertilizer and has a marked response to phosphorus. Phosphorus plays a key role in plant physiological processes and it is needed for energy storage and release in the living cells. Sixty kilogram per hectare phosphorus significantly enhanced the growth and yield parameters of mungbean and also increased the seed and straw protein (Ahmed *et al*. 1986). So, there is an ample scope of increasing the yield of mungbean $unit^{-1}$ area with improved management practices and modern varieties with proper fertilizer application. Thus, the objective of the study were to observe the growth and yield of four winter mungbean varieties with the application of different levels of phosphorus fertilizers and determine the optimum dose of phosphorus for obtaining higher yield of winter mungbean.

MATERIALS AND METHODS

The experiment was conducted at the Agronomy Field Laboratory, Bangladesh Agricultural University, Mymensingh during November 2010 to March 2011 in randomized complete block design with three replications. The experimental field is located at 24.75°N latitude and 90.5°E longitude at an altitude of 18m above from the sea level. The soil belongs to the Old Brahmaputra Alluvium Soil under Agro-ecological Zone-9. The climate of the locality is sub-tropical. The climate is characteristics by scanty rainfall associated with moderately low temperature during the period from November to March. The experimental soil was silty loam in texture with p^H 6.7. The experiment comprised four varieties of mungbean *viz.* BINA Mung-1, BINA Mung-3, BARI Mung-4 and BARI Mung-5 obtained from the Plant Breeding Division of Bangladesh Institute of Nuclear Agriculture (BINA), Mymensingh, and Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur, respectively and four levels of phosphorus application *viz.* 0, 12, 25 and 35 kg P ha^{-1}. The experimental field was prepared by repeated spading followed by laddering. After spading and laddering all the stubble and weeds were removed from the field. Before final land preparation, N and K fertilizers were applied at the rate of 20 and 30 kg ha^{-1}, respectively to the experimental 'field' as basal dose. Phosphorus was applied in form of TSP following the treatment specification of the experiment. Initially, the experimental area was divided into three blocks to represent three replications. There were 48 unit plots in the experiment. Each block was divided into 16 sub- plots. Block to block and plot to plot distances were 1.0m and 0.5m, respectively. The unit plot size was 4.0m×2.5m. The sowing depth was maintained at about 3 cm from the soil surface. Thinning of seedlings were done at 20 days after sowing (DAS) of mungbean seeds for maintaining uniform plant stands. First weeding was done at the time of thinning and second weeding after five weeks of sowing. No irrigation was given to the plot during the experimental period as there was no symptom of moisture stress. Insecticide (Diazinon) was applied to protect the crop from insect infestation. The crop was first harvested when about 80% pods of the plants became mature. The mature pods were harvested by hand picking from the crop plants of the individual plots and were kept separately in properly tagged gunny bags. Then the harvested pods were sun dried. The properly dried pods were bitten to release the seeds from the pods. Then the seeds were separated from the husk and cleaned. Harvesting was done in three times. The collected seeds were dried in the sun to keep the moisture content at about 12% level. The dried and cleaned seed and straw were weighed plot wise and converted to kg ha^{-1}. Data on different parameters were recorded from randomly selected plants in each plot. Seed yield and straw yield together were regarded as biological yield. The biological yield was calculated with the following formula:

Biological yield = Seed yield + Stover yield

Harvest index was calculated with the following formula:

$$\text{Harvest index} = \frac{\text{Seed yield}}{\text{Seed yield} + \text{Stover yield}} \times 100$$

The collected data were analyzed statistically using the analysis of variance (ANOVA) for each of the characters under study was done by F (variance) ratio. The difference among treatment means were compared by Duncan's Multiple Range Test (Gomez and Gomez, 1984) with the help of a computer based statistical package programme MSTAT-C.

RESULTS AND DISCUSSION

Effect of variety

Variety had a significant effect on number of pods $plant^{-1}$, mature pods $plant^{-1}$, pod length, number of seeds pod^{-1}, seed weight $plant^{-1}$, 1000-seed weight, seed yield, straw yield, biological yield and harvest index .The highest number of pods $plant^{-1}$ (20.45), mature pods $plant^{-1}$ (14.97), pod length (5.49 cm), seeds pod^{-1} (17.78), seed weight $plant^{-1}$(29.49 g), 1000-seed weight (40.68 g), seed yield (1.34 t ha^{-1}), straw yield (3.00 t ha^{-1}), biological yield (4.34 t ha^{-1}), harvest index (36.06%) were produced by BARI Mung-5 (Table 1). The second highest number of pods $plant^{-1}$ (18.85), mature pods $plant^{-1}$(12.66) were obtained from BARI Mung-4. The second highest seed weight $plant^{-1}$(18.54 g) was produced from BINA Mung-3 which was statistically identical with BARI Mung-4 (17.14 g). The second highest pod length (5.41 cm) was obtained by BINA Mung-1. The next highest pod length (5.27 cm) was produced by BARI Mung-4. The second highest seeds pod^{-1} (15.73) was followed by BINA Mung-3 which was statistically identical to BARI Mung-4 (15.09). The second highest weight of 1000 seeds (36.68 g) was found in BINA Mung-3, which was statistically identical with BARI Mung-4 (35.85 g). The second highest harvest index (34.92%) was obtained by BINA Mung-3. The next highest harvest index (32.30%) was obtained from BARI Mung-4 which was statistically identical (31.18%) with BINA Mung-1 (Table 1). It might be due to higher seed yield and similar straw yield in BARI Mung-5 compared to BINA Mung-1. These findings are in agreement with that of Aguilar and Villareal (1989). On the other hand, BINA Mung-1 produced the lowest number of pods $plant^{-1}$(17.12), mature pods $plant^{-1}$(10.4), number of seeds $plant^{-1}$ (14.07), seed weight $plant^{-1}$ (11.74 g), biological yield (3.3 t ha^{-1}) and harvest index (31.18 %) (Table 1). Among the studied four varieties BARI Mung-5 gave the highest seed yield (1.34 t ha^{-1}).

The second highest seed yield (1.27 t ha^{-1}) was produced by BARI Mung-4 which was statistically identical to BINA Mung-3. The lowest seed yield (1.14 t ha^{-1}) was produced by BINA Mung-1 (Fig. 1). The highest straw yield (3.00 t ha^{-1}) was produced by BARI Mung-5. The second highest straw yield (2.66 t ha^{-1}) was produced by BINA Mung-3, which was statistically identical (2.26 t ha^{-1}) to BARI Mung-4. The lowest straw yield (2.15 t ha^{-1}) was produced by BINA Mung-1 (Fig. 1). It might be due to maximum plant height $plant^{-1}$, higher number of branches $plant^{-1}$ and number of pods $plant^{-1}$ that contributed to higher straw yield. These results are similar with the findings of Chowdhury *et al.* (1989) who reported that stover yield varied due to variety. Uddin *et al.* (2013) reported that BARI Mung-6 also produced the highest seed yield (1.10 t ha^{-1}), which was similar to BARI Mung-5. Shaharia (1988) also reported that varieties differ significantly in respect of plant height, seed weight and grain yield.

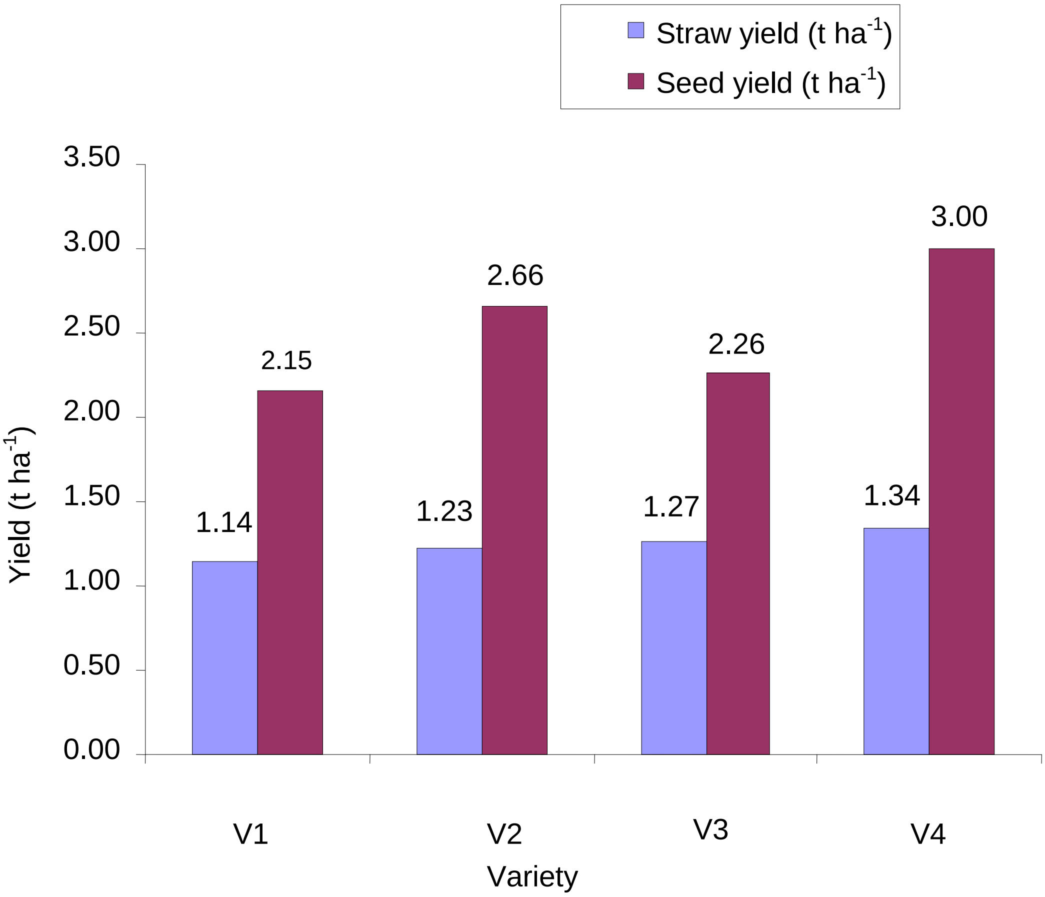

Fig. 1. Seed and straw yield (t ha^{-1}) as influenced by variety

Table 1. Effect of variety on yield and yield contributing characters of mungbean

Varieties	No of pods plant^{-1}	Mature pods plant^{-1}	Length of pod (cm)	No of seeds pod^{-1}	Seed wt. plant^{-1} (g)	1000-seed wt (g)	Biological yield (t ha^{-1})	Harvest Index (%)
BINAMung-1(V_1)	17.12c	10.40c	5.41ab	14.07c	11.74c	34.04c	3.30d	31.18d
BINAMung-3(V_2)	18.65b	12.36b	5.22b	15.73ab	18.54ab	36.68ab	3.88b	34.92b
BARIMung-4(V_3)	18.85b	12.66ab	5.27b	15.09b	17.14b	35.85b	3.52c	32.30c
BARIMung-5(V_4)	20.45a	14.97a	5.49a	17.78a	29.49a	40.68a	4.34a	36.06a
CV(%)	2.19	3.22	4.64	2.42	7.24	3.37	4.06	4.38
Level of sig.	**	**	**	**	**	**	**	**

** = Significant at 1% level of probability

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Effect of phosphorus level

Number of pods plant^{-1} was significantly affected due to application of phosphorus. From table 2, it is found that the application of 25 kg P ha^{-1} produced the highest number of pods plant^{-1} (19.52). The second highest number of pods plant^{-1} (18.87) was produced at 35 kg P ha^{-1}. The third highest number of pods plant^{-1} (18.65) was obtained from the application of 12 kg P ha^{-1}.The control treatment produced the lowest number of pods plant^{-1} (18.03). Increasing level of phosphorus up to 25 kg P ha^{-1} increased the number of pods plant^{-1} and after that it decreased. This result is in agreement with the findings of Soni and Gupta (1999). Pod length varied significantly when different doses of phosphorus fertilizer were applied. Plants which received 25 kg P ha^{-1} produced the longest pod (5.64 cm) which was statistically identical (5.31 cm) with the application 35 kg P ha^{-1} (Table 2). On the other hand, plants sown without phosphorus fertilizer gave the lowest pod length (5.16cm) (Table 2). It was found that pod length increased with increasing phosphorus application up to 25 kg P ha^{-1}and after that it was decreased (Table 2). Phosphorus had a significant effect on the number of seeds pod^{-1}. Application of 25 kg P ha^{-1} produced the highest number of seeds pod^{-1} (16.41) which was statistically identical (16.21) with the application of 35 kg P ha^{-1} (Table 2). The next highest number of seeds pod^{-1} (15.73) produced with the application 12 kg P ha^{-1}. The lowest number of seeds pod^{-1} (14.32) was produced in control treatment. It was observed that increase of phosphorus fertilizer exhibited an increase in seed plant^{-1} and reached the maximum at 25 kg P ha^{-1} and further increase of phosphorus did not increase the seed number plant^{-1}. The present result is similar to the report of Kalita (1989). The weight of 1000-seeds of studied mungbean was significantly affected by phosphorus application. The highest weight of 1000- seeds (39.39 g) was obtained from the application of 25 kg P ha^{-1}. The second highest weight of 1000- seeds (37.08 g) was obtained when the crop was fertilized with 35 kg P ha^{-1}. The next highest weight of 1000-seeds (36.34 g) was obtained from the application of 12 kg P ha^{-1}. The lowest weight 1000 seeds (34.44 g) were obtained from the control treatment (Table 2). Phosphorus fertilizer exerted highly significant effect on harvest index Form table 2, it is revealed that application of 25 kg P ha^{-1} gave the highest harvest index (35.94%). The second highest harvest index (34.43%) was obtained from the application of 35 kg P ha^{-1} and the third highest harvest index (32.96%) was found at 12 kg P ha^{-1}. The lowest harvest index (31.14%) was obtained from control treatment. Phosphorus fertilizer gave a significantly higher grain yield and straw yield over control because of proper utilization of nutrients and ultimately gave higher harvest index.

The influence of phosphorus fertilizer on seed yield was highly significant. Application of 25 kg P ha^{-1} produced the highest seed yield (1.32 t ha^{-1}) and the second highest (1.25 t ha^{-1}) was obtained from 35kg P ha^{-1}, which was statistically identical (1.22 t ha^{-1}) by the application of 12 kg P ha^{-1}. Control treatment produced (1.18 t ha^{-1}) the lowest seed yield (Fig. 2). In general, seed yield at 25 kg P ha^{-1} increased because of more branches plant^{-1}, pods plant^{-1}, seeds pod^{-1} and higher pod length. The results of the present work is consistent with that of Kalita (1989), Tank *et al.* (1992) and Shukla and Dixit (1996). It was markedly observed that increase in the rate of phosphorus increased seed yield and reached the maximum at 25 kg P ha^{-1} and further increase of phosphorus did not increase the seed yield. Phosphorus fertilizer had significant effect on straw yield. The highest straw yield (2.99 t ha^{-1}) was obtained from application of 25 kg P ha^{-1}. The second highest straw yield (2.58 t ha^{-1}) was obtained from 35 kg P ha^{-1} and the lowest straw yield (2.13 t ha^{-1}) was obtained from the control treatment. An increasing trend was observed in straw yield up to the application of 25 kg P ha^{-1} and after that it was decreased (Fig. 2).

Table 2. Effect of phosphorus on yield and yield contributing characters of mungbean

Level of Phosphorus(Kg ha^{-1})	No of pods plant^{-1}	Mature pods plant^{-1}	Length of pod (cm)	No of seeds pod^{-1}	Seed wt. plant^{-1} (g)	1000 -seeds wt. (g)	Biological yield (t ha^{-1})	Harvest Index (%)
0(P_0)	18.03c	11.39c	5.16c	14.32c	13.42c	34.44d	3.31d	31.14d
12(P_1)	18.65b	12.27b	5.28b	15.73b	19.22b	36.34c	3.59c	32.96c
25(P_2)	19.52a	13.80a	5.64a	16.41a	24.37a	39.39a	4.31a	35.94a
35(P_3)	18.87ab	12.94ab	5.31b	16.21ab	19.90ab	37.08b	3.83b	34.43b
CV(%)	2.19	3.22	4.64	2.42	7.24	3.37	4.06	4.38
Level of sig.	**	**	**	**	**	**	**	**

**Significant at 1% level of probability

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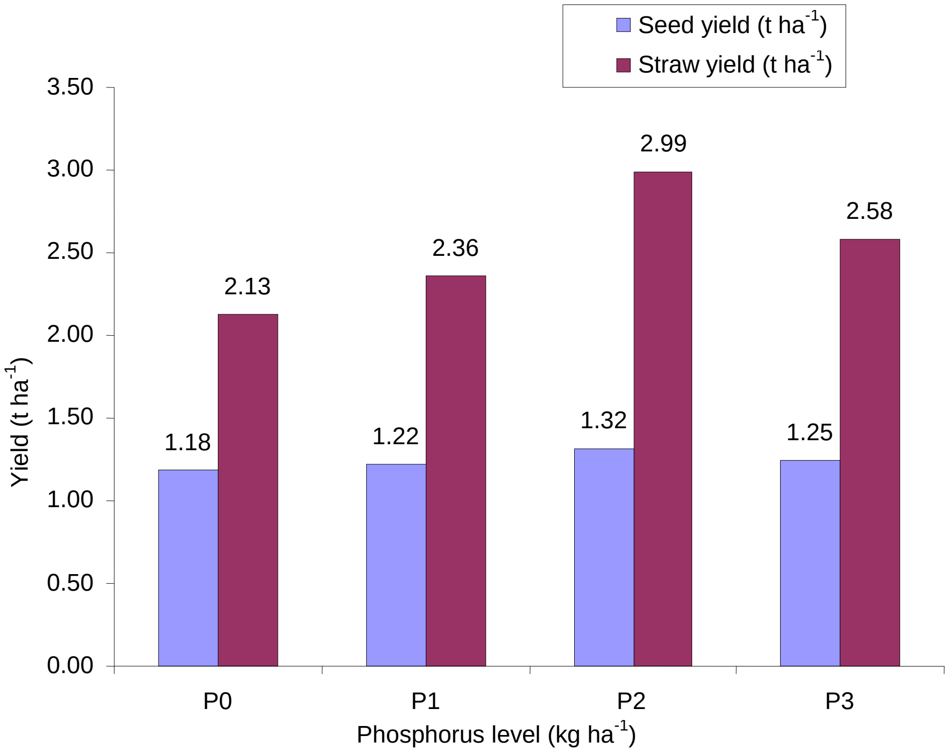

Fig. 2. Seed and straw yield (t ha^{-1}) as influenced by phosphorus
(Here, P_0 = 0 Kg P ha^{-1}, P_1 = 12 Kg P ha^{-1}, P_2 = 25 Kg P ha^{-1}, P_3 = 35 Kg P ha^{-1})

Effect of interaction

The interaction effect of variety and level of phosphorus on the number of pods $plant^{-1}$ was significant. The highest number of pods $plant^{-1}$ (20.98) was obtained from BARI Mung-5 at 25 kg P ha^{-1} and the lowest number of pods $plant^{-1}$ (16.17) was produced by BINA Mung-1 at control treatment (Table 3). Interaction between variety and levels of phosphorus has significant effect in respect of pod length. Apparently, the highest pod length (6.30 cm) was obtained by BARI Mung-5 grown with 25 kg P ha^{-1} followed by same variety at 35 kg P ha^{-1}. On the other hand, the shortest pod length was obtained by all varieties in control treatments (Table 3). It might be due to similar response of four varieties to phosphorus fertilizer over control. Interaction between variety and levels of phosphorus has significant effect on the number of seeds pod^{-1}. Apparently, the highest number of seeds pod^{-1} (18.70) was obtained by BARI Mung-5 grown with 25 kg P ha^{-1}. On the other hand, the shortest number of seeds pod^{-1} was obtained by all varieties in control treatments (Table 3). It might be due to similar response of four varieties to phosphorus fertilizer over control. Apparently the highest 1000-seed weight (43.07g) was observed in BARI Mung-5 fertilized with 25 kg P ha^{-1} and the lowest was in all varieties in control treatment (Table 3). It was followed from the experimental result that four varieties showed significant response to phosphorus. The interaction effect of variety and phosphorus level had significant influence on seed yield. Among four varieties BARI Mung-5 gave the highest seed yield(1.44 t ha^{-1}) with the application of 25 kg P ha^{-1} followed by same the variety (1.35 t ha^{-1}) with the application of 35 kg P ha^{-1}. The lowest seed yield (1.09 t ha^{-1}) was obtained from BINA Mung-1 at control treatment. The result of the study might be due to different responses of four varieties of mungbean to phosphorus fertilizer in case of seed yield. Interaction between varieties and phosphorus had a significant effect on straw yield. Maximum straw yield (3.73 t ha^{-1}) was obtained from the variety BARI Mung-5 at 25kg P ha^{-1}, which was statistically identical (3.48 t ha^{-1}) to BINA Mung-3 at the same level of phosphorus(Table 3). The lowest straw yield was obtained from the variety BINA Mung-1 with control treatment. The analysis of variance showed that the interaction effect of variety and phosphorus level on harvest index was significant. The highest harvest index (38.89%) was found in BARI Mung-5 at 25 kg P ha^{-1}, the second highest (38.83%) was obtained from BINA Mung-3 at 25 P ha^{-1} (Table 3). The lowest harvest index in the all varieties were produced by control treatment.

Table 3. Interaction effect of variety and level of phosphorus on yield and yield contributing characters of mungbean

Interaction (Varieties × Phosphorus)	No of pods plant^{-1}	Mature pods plant^{-1}	Length of pod(cm)	No of seeds pod^{-1}	Seed wt. plant^{-1} (g)	1000-seeds wt (g)	Seed yield m^{-2} (g)	Straw yield m^{-2} (g)	Seed yield (t ha^{-1})	Straw yield (t ha^{-1})	Biological yield (t ha^{-1})	Harvest Index (%)
$V_1 \times P_0$	16.17f	9.64i	5.14cd	13.14h	8.26k	30.82h	10.85i	17.15g	1.09k	1.72g	2.80g	27.38g
$V_1 \times P_1$	17.09e	10.12hi	5.31bc	14.38efg	11.04j	31.99h	11.33h	21.16ef	1.13j	2.12ef	3.25f	34.97bcd
$V_1 \times P_2$	17.16e	10.95fg	5.69b	13.93fg	14.77hi	38.46cd	11.91ef	23.77de	1.19h	2.38de	3.57de	33.40cde
$V_1 \times P_3$	17.30e	10.88fg	5.49bc	14.81de	12.89ij	34.90fg	11.56gh	24.09d	1.16i	2.41d	3.57de	32.47de
$V_2 \times P_0$	18.41d	11.31f	5.22bcd	14.10fg	11.81j	32.96gh	11.83fg	20.50f	1.18h	2.05f	3.23f	36.61ab
$V_2 \times P_1$	18.02d	11.45f	5.18cd	16.10c	18.71f	37.75cde	11.92ef	21.47def	1.19h	2.15def	3.34ef	35.91bc
$V_2 \times P_2$	19.74c	14.05d	5.22bcd	16.53c	24.03c	38.49cd	13.12c	34.80b	1.31d	3.48b	4.79b	38.83a
$V_2 \times P_3$	18.44d	12.60e	5.26bcd	16.19c	19.61ef	37.52de	12.16e	29.47c	1.22g	2.95c	4.16c	29.32fg
$V_3 \times P_0$	16.97e	10.57gh	5.26bcd	13.88g	12.20j	35.73ef	12.13ef	24.03d	1.21g	2.40d	3.62de	33.56cde
$V_3 \times P_1$	18.67d	12.62e	5.33bc	14.60ef	15.42gh	34.23fg	12.52d	22.50def	1.25ef	2.25def	3.50def	27.79g
$V_3 \times P_2$	20.21bc	14.31cd	5.36bc	16.47c	23.51cd	37.55de	13.31bc	23.80de	1.33bc	2.38de	3.71d	35.98bc
$V_3 \times P_3$	20.80ab	13.15e	5.14cd	15.42d	17.45fg	35.87ef	12.67d	19.93f	1.27e	1.99f	3.26f	35.82bc
$V_4 \times P_0$	20.63ab	14.03d	5.35bc	16.17c	21.43de	38.25cd	12.46d	23.47de	1.25f	2.35de	3.59de	34.77bcd
$V_4 \times P_1$	19.59c	14.87bc	4.81d	17.82b	31.69b	41.37ab	13.21bc	29.47c	1.32cd	2.95c	4.27c	31.01ef
$V_4 \times P_2$	20.98a	15.86a	6.30a	18.70a	35.19a	43.07a	14.35a	37.33a	1.44a	3.73a	5.17a	38.89a
$V_4 \times P_3$	20.15bc	15.13b	5.49bc	18.44ab	29.66b	40.02bc	13.46b	29.80c	1.35b	2.98c	4.33c	31.16ef
CV(%)	2.19	3.22	4.64	2.42	7.24	3.37	1.57	5.95	1.57	5.95	4.06	4.38
Level of sig.	**	**	**	**	**	**	**	**	**	**	**	**

** = Significant at 1% level of probability

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From the above results of the experiment it reveals that growth, yield and yield contributing characters of mungbean differ from variety to variety and levels of phosphorus fertilization BARI Mung-5 appeared as the promising one in terms of seed yield as compared with other varieties studied. The increase of phosphorus fertilizer enhanced seed and straw yield up to 25 kg P ha^{-1}. Interaction concerned that BARI Mung-5 with 25 kg P ha^{-1} appears as the best combination in winter season for mungbean production.

CONCLUSION

It can be concluded that BARI Mung-5 performed better than BARI Mung-4, BINA Mung-3 and BINA Mung-1 in respect of production. Application of phosphorus up to 25 kg P ha^{-1} increased the seed yield, but further higher dose of phosphorus decreased seed yield. BARI Mung-5 grown with 25 P ha^{-1} emerged as the promising one in respect of seed yield ha^{-1} compared to other treatment combinations. This conclusion has been made based on the results of the study that was conducted in one *Rabi* season only. Further research is, therefore, necessary to arrive at a definite conclusion because fertility status of Bangladesh soil varies from place to place or region to region or season to season.

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