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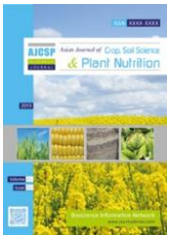

Potassium and Weed Control Methods affected on Yield of Mungbean

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ABSTRACT

Mungbean is very promising pulse crop in Bangladesh but imbalance use of fertilizer and inappropriate weed management are the key reason for substantially lower yield of mungbean. Therefore, the experiment was conducted at the research plot of Sher-e-Bangla Agricultural University farm, Dhaka during the period from February, 2017 to June, 2017 to study the effect of potassium levels and weed control methods on the growth and yield of mungbean. The treatment consisted of three potassium level viz. K_0= Control (No Potassium), K_1 = Recommended dose of Potassium (R), K_2 = 30% increased of R and four weed control methods viz., W_0 = No weeding (control), W_1 = One hand weeding at 15 days after sowing (DAS), W_2 = Two hand weeding at 15 DAS and 30 DAS, W_3 = One paraxon spray at 15 DAS. The experiment was laid out in a two factors randomized complete block design (RCBD) with three replications. The seeds of BARI mung-6 variety were the test materials. The highest plant height (45.30 cm), number of branch (10.54 cm), number of leaflets (17.00) and dry weight plant^{-1} (7.30) was observed $K_2 \times W_2$ treatment. The highest plant height (27.90), pod length (9.48 cm), seeds pod^{-1} (10.22), weight of 1000 seeds (41.75 g), seed yield (1.63 t ha^{-1}), strove yield (2.76 t ha^{-1}), biological yield (4.37 t ha^{-1}) and harvest Index (37.13%) was observed in the 30% increased of recommended dose of Potassium with two hand weeding ($K_2 \times W_2$). The lowest plant height (21.08) was observed control (No Potassium and no weeding) ($K_0 \times W_0$). The results indicated that the plants performed better in respect of seed yield and others yield contributing characters in $K_2 \times W_2$ (30% increased of recommended dose of Potassium with two hand weeding) treatment than the control treatment $K_0 \times W_0$ showed the least performance. Treatment $K_2 \times W_2$ (30% increased of recommended dose of Potassium with two hand weeding) was found to the most suitable combination for the highest yield of mungbean.

Key Words: *Mungbean, Potassium, Vigna radiata L. Weed control methods and Yield.*

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I. Introduction

Mungbean (*Vigna radiata* L.) is a vital crop belongs to the family Fabaceae (Khattak et al., 2004). Its edible grain is characterized by good digestibility, flavour, high protein content and absence of any flatulence effects. It also contains amino acid, lysine which is generally deficit in food grains (Elias et

al., 1986). It holds the 3rd in respect of protein content, acreage and production and first in market price (BBS, 2014). It is grown three times in a year covering 27530 ha with an average yield of 0.69 t ha^{-1} (BBS, 2015). Mungbean is cultivated for both human consumption and as fodder for animal. Its seed contains 51% carbohydrate, 26% protein, 10% moisture, 4% mineral and 3% vitamin (Afzal et al., 2008). In Bangladesh, total production of pulse is only 0.65 million ton against 2.7 million ton requirement, which accounted for lower yield capacity of the crop (MoA, 2005). Mungbean per hectare yield obtained at farmers field is low, because no systematic efforts have been made in the past to develop a package of technology, which may ensure high seed yield of this crop. Important reasons for low yield of mungbean on farmer's field are the continuous cultivation of traditional low potential cultivars, use of low seed rate and improper agronomic practices (Ansari et al., 2000). Among many other crop production constraints, poor plant spacing and weed management are the most important areas which contribute substantially lower seed yield of mungbean (Ismail and Hall, 2000; Khan et al., 2001).

Weed is one of the most important factors responsible for lower yield of crop (Islam et al., 1989; Rehman and Ullah, 2009). All crops have a vulnerable stage during their life cycle when they are particularly sensitive to weed competition. In general, it ranges up to first 25-50% of the life time of crops. Critical period of weed competition is the range within which a crop must be weeded to save the crop from yield loss (Islam et al., l989). Mungbean is not very competitive against weed and therefore weed control is essential for mungbean production. Seed yield of mungbean was maximum (2108 $kgha^{-1}$) in the weed free treatment (Punia et al., 2004) whereas about 69% reduction in mungbean grain yield due to weeds was estimated by Yadav and Singh (2005).

It was worldwide known that the importance of K fertilizer for the crop production and its quality. A strong positive relationship between K fertilizer input and grain yield has been shown (Dong et al., 2010). K is essential for many physiological processes, such as photosynthesis, translocation of photosynthates into sink organs, maintenance of turgidity and activation of enzymes under stress conditions (Mengel and Kirkby, 2001). Potassium supply in high amounts can provide protection against oxidative damage caused by chilling or frost. A high K+ concentration activated the plant's antioxidant systems which are associated with cold tolerance (Devi et al., 2012*)*. Higher concentration of K in plant tissue increased cold resistance and reduced chilling damage that increasing yield. Potassium fertilization significantly reduced frost damage which was inversely related to K concentration. Therefore, the present study was undertaken to study the effect of potassium and weed control method on yield attributes and yields of mungbean.

II. Materials and Methods

The experiment was conducted at the Agronomy field of Sher-e-Bangla Agricultural University, Dhaka, during the period of March 2017 to May 2017 to study the effect of potassium levels and weed control methods on the growth and yield of mungbean. (cv. BARI mung-6). Geographically the experimental field was located at 23° 77′ N latitude and 90° 33' E longitudes at an altitude of 9 m above the mean sea level. The soil belonged to the AEZ-28. The land topography was medium high and soil texture was silty clay with pH 6.1.

BARI mung-6 was used as planting material. It is highly photoinsensetive. One of the main characteristics of this cultivar is synchronization of pod ripening. Average yield of this cultivar is about 1.6-2.0 ton ha^{-1}. It contains about 21.2% protein and 46.6% carbohydrate. The treatment consisted of three potassium level viz. K_0= Control (No Potassium), K_1 = Recommended dose of Potassium (R), K_2 = 30% increased of R and four weed control methods viz., W_0 = No weeding (control), W_1 = One hand weeding at 15 days after sowing (DAS), W_2 = Two hand weeding at 15 DAS and 30 DAS, W_3 = One paraxon spray at 15 DAS. The experiment was laid out in a two factors Split Plot design (RCBD) with three replications. Potassium was used as main plot. There were 12 treatment combinations and 36 unit plots. The unit plot size was 5.52 m^2 (2.4 m X 2.3 m). The fertilizers were applied as basal dose @ N, P and K as 20, 17 and 20 kg ha^{-1} at final land preparation respectively in all plots and Seeds were sown at the rate of 40 kg ha^{-1}.

Data were collected on pods plant^{-1}, pod length, seeds pod^{-1}, 1000 seeds weight, grain yield, stover yield, biological yield and harvest index. The collected data were analyzed statistically using the analysis of variance (ANOVA) technique with the help of a computer package program MSTAT- C and the mean differences were adjusted by Least Significance Difference (LSD) test at 5% level of significance.

III. Results and Discussion

Plant height: Potassium, weed management and their interaction showed statistically significant variation in respect of plant height. Among the treatment, K_2 showed the highest plant height (43.90 cm) and the lowest plant height (41.42 cm) was observed in the K_0. This result is similar with the findings of Thesiya et al. (2013) who found significant increase in plant height of blackgram due to the application of potassium. The highest plant height (44.42 cm) was recorded in W_2 where the lowest was measured (44.42 cm) in W_0 treatment. The result under the present study was in partial agreement with the findings of Chattha et al. (2007). Chattha et al. (2007) found that among different weed control methods, chemical-weeding at 2 - 3 leaf stage of Weeds + hand-weeding at 50 DAS gave maximum plant height compared to weedy check treatment. The highest plant height (45.30 cm) was observed in $K_2 \times W_2$ and the lowest plant height (39.09 cm) was observed $K_0 \times W_0$.

Branch Plant^{-1} (no.): Application of potassium, weed management and their interaction showed significant variation on the number of branches plant^{-1} of mungbean. Treatment K_2 showed the highest number of branches plant^{-1} (10.25 cm) and the lowest (9.68 cm) was the fertilizer dose of K_0. Optimum fertilizer level might be increased the vegetative growth of mungbean that lead to the highest number of branch per plant. Biswash et al. (2014) showed that increasing potassium levels have significant effect on number of branches plant^{-1} of mungbean. The highest number of branches plant^{-1} (10.40) was recorded in W_2 and the lowest was in W_0 (9.49). Muhammad et al. (2004) reported that weeding were applied twice, *i.e.* at 10 and 35 days after sowing significantly affected number of branches plant^{-1}. The highest plant height (10.54) was observed in $K_2 \times W_2$ at harvest.

Dry weight plant^{-1}: Different level of potassium, weeding and their interaction showed significant variation was observed in dry weight plant^{-1} of mungbean when were applied. Among the different treatment K_2 showed the highest dry weight plant^{-1} (7.07 g). On the contrary, the lowest dry weight plant^{-1} (6.70) was observed with K_0 where no potassium was applied. The maximum dry weight plant^{-1} (13.37 g) was recorded in W_2. The lowest dry weight plant^{-1} was achieved with W_0 (9.81 g). The result under the present study was in agreement with the findings of Kumar and Kairon (1988) and Malik et al. (2005). Kumar and Kairon (1988) found that weed biomass increased and mungbean yield decreased with delay in weeding. They also reported that weed removal at 30 and 40 days after sowing showed high yield. The highest dry weight plant^{-1} (7.30) was observed in $K_2 \times W_2$ and the lowest dry weight plant^{-1} (6.33 cm) was observed $K_0 \times W_0$.

Pods number plant^{-1}: Number of pod per plant showed significant variation due to potassium, weeding level and their interaction. The highest number of pod per plant (26.16) was obtained from the grown with the dose of K_2 and the lowest number of pod per plant (23.41) was found in K_0. Biswash et al. (2014), Thesiya et al. (2013) and Ali et al. (1996) also found similar results. It is remarked from the present study that the increasing number of weeding significantly increased number of pods plant^{-1}. W_2 treatment produced maximum number of pods plant^{-1} (26.77) and the lowest (23.12) was achieved with W_0. The result under the present study was in agreement with the findings of Akter et al. (2013) and Khan et al. (2011). Akter et al. (2013) observed that three-stage weeding (Emergence-Flowering and Flowering- Pod setting and pod setting-Maturity) ensured the highest number of pods (22.03) plant^{-1}. The highest plant height (27.90) was observed in $K_2 \times W_2$ and the lowest plant height (21.08) was observed in $K_0 \times W_0$.

Pod length (cm): Potassium and interaction effect of potassium and weeding showed non-significant effect on pod length at harvest. K_2 treatment showed the highest pod length (9.10 cm). The lowest pod length (8.85) was recorded with K_0 treatment. Thesiya et al. (2013) also found the similar result. The highest pod length (9.40cm) was recorded in W_2 and the lowest pod length (8.64 cm) was achieved by W_0.

Seeds pod^{-1} (no.): Potassium, weeding level and their interaction showed significant variation on number of seed pod^{-1}. K_2 treatment showed the highest number of seed per pod (9.58) and the lowest (8.57) was recorded with K_0 treatment. Optimum fertilizer level might be increased the vegetative growth and development of mungbean that lead to the highest number of seed per pod. Biswash et al. (2014), Thesiya et al. (2013) and Ali et al. (1996) found that number of seeds per pod significantly increased by potassium application. The highest number of seeds pod^{-1} (9.80) was recorded in W_2 and the lowest number of seeds pod^{-1} (8.47) was achieved by W_0. Similar findings were found by Kundu et al. (2009), observed that seeds pod^{-1} was highest in the treatment having quizalofop-p-ethyl @ 50 g a.i. ha^{-1} at 21 DAE + HW at 28 DAE. The highest seeds pod^{-1} (10.22) was observed in $K_2 \times W_2$ and the lowest seeds pod^{-1} (7.72) was observed $K_0 \times W_0$.

Table 01. Potassium, weeding level and their interaction on yield attributes and yield of mungbean

	Plant height (cm)	Branch plant^{-1} (no.)	Dry weight plant^{-1} (g)	Pods plant^{-1} (no.)	Pod length (cm)	Seeds pod^{-1} (no.)	Weight of 1000 seeds (g)	Seed yield (t ha^{-1})	Stover yield (t ha^{-1})	Biological yield (t ha^{-1})	HI (%)
Effect of potassium											
K_0	41.42b	9.68b	6.70b	23.41c	8.85	8.57c	39.94c	1.21c	2.47b	3.67c	32.80c
K_1	43.49a	10.25a	7.07a	25.63b	8.92	9.39b	40.21b	1.38b	2.64a	4.02b	34.29b
K_2	43.90a	10.15a	7.02a	26.16a	9.10	9.58a	40.48a	1.50a	2.61a	4.10a	36.49a
CV (%)	6.57	4.75	6.42	6.73	5.67	4.11	4.32	3.57	4.93	4.10	4.86
$LSD_{(0.05)}$	0.532	0.118	0.072	0.243	-	0.087	0.23	0.011	0.032	0.036	0.291
Effect of weeding level											
W_0	40.81c	9.49d	6.60c	23.12d	8.64c	8.47d	38.83c	1.21d	2.42d	3.63d	33.31d
W_1	42.56b	9.94c	6.87b	24.66c	9.07b	9.03c	40.38b	1.33c	2.54c	3.87c	34.32c
W_2	44.42a	10.40a	7.17a	26.77a	9.40a	9.80a	41.48a	1.49a	2.71a	4.20a	35.47a
W_3	43.95a	10.26b	7.08a	25.71b	8.72c	9.42b	40.16b	1.41b	2.62b	4.03b	34.99b
CV (%)	7.51	5.43	7.34	5.69	6.48	4.70	4.94	4.08	5.63	4.69	5.55
$LSD_{(0.05)}$	0.641	0.143	0.088	0.171	0.308	0.024	0.43	0.031	0.027	0.031	0.150
Interaction Effect											
$K_0 \times W_0$	39.09h	9.02f	6.33g	21.08	8.85	7.72h	38.56h	1.03h	2.28g	3.31h	31.10i
$K_0 \times W_1$	40.96g	9.56e	6.63f	23.10	9.41	8.46g	40.11g	1.18g	2.44f	3.62g	32.61h
$K_0 \times W_2$	43.07c-e	10.19bc	6.98c-e	25.14	9.38	9.21e	41.21d	1.34d	2.60c	3.94e	34.02f
$K_0 \times W_3$	42.55de	9.93cd	6.87de	24.31	8.77	8.90f	39.89ef	1.28ef	2.54de	3.81f	33.48g
$K_1 \times W_0$	42.22ef	9.85d	6.82e	24.05	8.67	8.81f	38.83f	1.26f	2.52e	3.77f	33.30g
$K_1 \times W_1$	43.26c-e	10.10b-d	6.98c-e	24.85	8.92	9.10e	40.38de	1.32de	2.58cd	3.89e	33.83f
$K_1 \times W_2$	44.89ab	10.48a	7.22ab	27.27	9.36	9.99b	41.48b	1.51b	2.75a	4.28b	35.27d
$K_1 \times W_3$	45.22ab	10.56a	7.27a	26.33	8.72	9.65c	40.16	1.44c	2.70b	4.13cd	34.75e
$K_2 \times W_0$	41.12fg	9.60e	6.66f	24.24	8.39	8.88f	39.10d	1.35d	2.45f	3.80f	35.53c
$K_2 \times W_1$	43.47cd	10.15bc	7.01cd	26.02	8.87	9.53d	40.65bc	1.49bc	2.59c	4.08d	36.53b
$K_2 \times W_2$	45.30a	10.54a	7.30a	27.90	9.48	10.22a	41.75a	1.63a	2.76a	4.37a	37.13a
$K_2 \times W_3$	44.08bc	10.29ab	7.10bc	26.48	8.67	9.70c	40.43b	1.53b	2.63c	4.15c	36.76b
CV (%)	7.51	5.43	7.34	5.69	6.48	4.70	4.94	4.08	5.63	4.69	5.55
$LSD_{(0.05)}$	1.11	0.248	0.153	-	-	0.108	0.054	0.054	0.045	0.054	0.260

Figures in a column followed by different letter (s) differs significantly whereas figures having common letter(s) do not differ significantly from each other as per LSD. K_0= Control (No Potassium), K_1 = Recommended dose of Potassium (R), K_2 = 30% increased of Recommended dose of Potassium, W_0 = No weeding (control), W_1 = One hand weeding at 15 days after sowing (DAS), W_2 = Two hand weeding at 15 DAS and 30 DAS, W_3 = One paraxon spray at 15 DAS

Weight of 1000 seeds (g): Application of potassium and weeding level showed significant variation on thousand seed weight but their interaction showed not significant variation. Among different treatment K_2 showed the highest thousand seed weight (40.481 g) and the lowest (39.94) was recorded with K_0 treatment. Biswash et al. (2014) found that the increase in potassium levels was significantly increasing the weight of 1000 seeds of mungbean. The highest weight of 1000 seeds (41.48 g) was recorded in W_2 whereas the lowest weight of 1000 seeds was achieved by W_0 (38.83 g).

The highest values (40.39 and 38.95 g) of 1000-seeds weight of mungbean in hand weeding plots with 17 and 5 percent increase over control were recorded by Khan et al. (2011).

Seed yield (t ha^{-1}): Seed yield significantly influenced by potassium, weeding level and their interaction. K_2 treatment gave the highest yield (1.50 t ha^{-1}) and the lowest seed yield (1.21 t ha^{-1}) was observed with K_0. Kurhade et al. (2015) and Thesiya et al. (2013) found that grain yields were also increased significantly by application of potassium fertilizer. The highest grain yield (1.49 t ha^{-1}) was recorded in W_2 which was 23.14% higher than lowest value while the lowest grain yield was achieved by W_0 (1.21 t ha^{-1}). Khan et al. (2011) investigated that hand weeding produced higher yield (1092 and 743.3 kg ha^{-1}) of mungbean compared to control (631 and 518.8 kg ha^{-1}). The highest seed yield (1.63 t ha^{-1}) was observed in $K_2 \times W_2$ and the lowest seed yield (1.03 t ha^{-1}) was observed in $K_0 \times W_0$.

Stover yield (t ha^{-1}): Potassium and weeding level on showed significant variations in respect of stover yield. Treatment K_1 showed the highest stover yield (2.64 t ha^{-1}) which was statistically similar with treatment K_2. On the contrary, the lowest stover yield (2.47 t ha^{-1}) was observed with K_0 treatment. Biswash et al. (2014) and Thesiya et al. (2013) also found the similar result in mungbean and blackgram, respectively. The highest stover yield (2.71 t ha^{-1}) was observed from W_2 which was statistically similar with W_1 and W_3 while the lowest stover yield (2.42 t ha^{-1}) from W_0. Interaction effect between different level of potassium and weeding showed non significant effect on strove yield.

Biological yield (t ha^{-1}): Biological yield was significantly influenced by potassium, level of weeding and their interaction. Treatment K_2 showed the highest biological yield (4.10 t ha^{-1}) and the lowest biological yield (4.20 t ha^{-1}) was observed with K_0 treatment. The maximum biological yield (4.10 t ha^{-1}) was recorded in W_2 and the minimum biological yield was achieved by W_0 (3.67 t ha^{-1}). The highest biological yield (4.37 t ha^{-1}) was observed in $K_2 \times W_2$ and the lowest biological yield (3.31 t ha^{-1}) was observed in $K_0 \times W_0$.

Harvest Index: Potassium fertilizers, weeding level and their interaction showed significant variations in respect of harvest index of mungbean. K_2 showed the highest harvest index (36.49 %), which was statistically similar with K_2 but the lowest harvest index (32.80 %) was observed with K_0 treatment. The highest harvest index (38.13%) was recorded in W_2 and the lowest harvest index was achieved by W_0 (30.94%). The highest harvest Index (37.13%) was observed in $K_2 \times W_2$ and the lowest harvest index (31.10%) was observed in $K_0 \times W_0$.

IV. Conclusion

The results in this study indicated that the plants performed better in respect of seed yield and yield contributing characters in $K_2 \times W_2$ (30% increased of recommended dose of potassium with two hand weeding at 15 DAS and 30 DAS) compare to other treatment combinations.

References

[1]. Afzal, M. A., Murshad, A. N. M. M., Bakar, M. M. A., Hamid, A. and Salahuddin, A. B. M. (2008). Mungbean Cultivation in Bangladesh, Pulse Research Station, Bangladesh Agricultural Research Institute, Gazipur, Bangladesh, p.13.

[2]. Akter, R., Samad, M. A., Zaman, F. and Islam, M. S. (2013). Effect of weeding on the growth, yield and yield contributing characters of mungbean (*Vigna radiata* L.). Journal of Bangladesh Agricultural University, 11(1), 53–60. https://doi.org/10.3329/jbau.v11i1.18209

[3]. Ali, A., Malik, M. A., Ahmad, R. and Atif, T. S. (1996). Response of mungbean to potassium fertilizer. Pakistan Journal of Agricultural Science, 33(1-4), 44-45.

[4]. Ansari, A. H., Kakar, A. A., Tareen, A. B., Barecht, A. R. and Kakar, G. M. (2000). Planting pattern and irrigation level effects on growth, yield components and seed yield of soybean (*Glycine max* L.). Pakistan Journal of Agriculture Science, 37, 61–64.

[5]. BBS (Bangladesh Bureau of Statistic). (2014). Major and minor crops statistics. www.bbs.gov.bd.

[6]. BBS (Bangladesh Bureau of Statistics). (2015). Statistical Yearbook of Bangladesh. Stat. Div., Minis. Plan., Govt. People's Repub. Bangladesh, Dhaka. P. 37.

[7]. Biswash, M. R., Rahman, M. W., Haque, M. M., Sharmin, M. and Barua, R. (2014). Effect of potassium and vermicompost on the growth, yield and nutrient contents of mungbean (BARI Mung 5). Open Science Journal of Bioscience Bioengineering, 1(3), 33-39.
[8]. Chattha, M. R., Jamil, M. and Mahmood, T. Z. (2007). Yield and Yield Components of Mungbean as Affected by Various Weed Control Methods under Rain-fed Conditions of Pakistan. International Journal of Agriculture Biology, 9 (1),114-119.
[9]. Devi, R. G., Pandiyarajan, V. and Gurusaravanan, P. (2012). Alleviating effect of IAA on salt stressed *Phaseolus mungo* (L.) with reference to growth and biochemical characteristics. Recent and Technology, 4(3), 22-24.
[10]. Dong, H., Kong X., Li W., Tang, W. and Zhang, D. (2010). Effects of plant density and nitrogen and potassium fertilization on cotton yield and uptake of major nutrients in two fields with varying fertility. Field Crop Research, 119, 106–113. https://doi.org/10.1016/j.fcr.2010.06.019
[11]. Elias, S. M., Hossain, M. S., Sikder, F. S., Ahmed, J. and Karim, M. R. (1986). Identification of constraints to pulse production with special reference to present farming systems. Annual Report of the Agricultural Economics Division, BARI, Joydebpur. p-1
[12]. Islam, M. A., Mamun, A. A., Bhuiyan, M. S. U. and Hossain, S. M. A. (1989). Weed biomass and grain yield in wheat as affected by seed rate and duration of weed competition. Bangladesh Journal of Agricultural Science, 14, 213-224.
[13]. Ismail, A. M. and Hall, A. E. (2002). Semi-dwarf and standard height cowpea responses to row spacing in different environment. Crop Science, 40, 1618-1624. https://doi.org/10.2135/cropsci2000.4061618x
[14]. Khan, R. U., Rashid, A. and Khan, M. S. (2011). Impact of various rates of pendimethalin herbicide on weed control, seed yield and economic returns in mungbean under rain fed conditions. Journal of Agriculture Research, 49(4), 171-177.
[15]. Khan, S., Shah, S., Akbar, H. and Khan, S. (2001). Effects of planting geometry on yield and yield components in mungbean. Sarhad Journal Agriculture, 17(4): 519-524.
[16]. Khattak, G. S. S., Ashraf, M. and Khan, M. S. (2004). Assessment of genetic variation for yield and yield components of mungbean (*Vigna radiata* L.) using generation mean analysis. Pakistan journal of Botany 36(3), 583-588. https://doi.org/10.1111/j.1601-5223.2001.00211.x
[17]. Kumar, S. and Kairon, M. S. (1988). Effects of time of weed removal on yield of green gram (*Vigna radiata*). Indian Journal of Agriculture Science, 58, 859-860.
[18]. Kundu, R., Bera, P. S. and Chari, K. B. (2009). Effect of different weed management practices in summer mungbean (*Vigna radiata* L.) under new alluvial zone of West Bengal. Journal of Crop and Weed, 5(2), 117-121.
[19]. Kurhade, P. P., Sethi, H. N. and Zadode, R. S. (2015). Effect of different levels of potassium on yield, quality, available nutrient and uptake of blackgram. International Journal of agriculture Science, 11(1), 175-178. https://doi.org/10.15740/HAS/IJAS/11.1/175-178
[20]. Malik, R. S., Yadav, A. and Malik, R. K. (2000). Efficacy of trifluralin, linuron and acetachlor against weeds in mungbean (*Vigna radiata*). Indian Journal of Weed Science, 32, 181–185.
[21]. Mengel, K. and Kirkby E. A. (2001). Principles of Plant Nutrition. 5th Edition. Kluwer Academic Publishers, Dordrecht, Boston, London, 849. https://doi.org/10.1007/978-94-010-1009-2
[22]. MoA (Ministry of Agriculture) (2005). Hand Book of Agricultural Statistics, December, 2005, p:14.
[23]. Muhammad, A. N., Rashid, A. and Ahmad, M. S. (2004). Effect of seed inoculation and different fertilizer levels on the growth and yield of mungbean (*Vigna radiata* L.). Journal of Agronomy, 3, 40-42. https://doi.org/10.3923/ja.2004.40.42
[24]. Punia, S. S., Malik, R. S., Yadav, A. and Rinwa, R. S. (2004). Effect of varying density of *Cyperus rotundus*, *Echinochloa colona* and *Trianthema portulacastrum* on mungbean. Indian Journal of Weed Science, 36, 280–291.
[25]. Rehman, A. and Ullah, E. (2009). Model farming. Dawn the internet edition; May 13, 2009.
[26]. Thesiya, N. M., Chovatia, P. K. and Kikani, V. L. (2013). Effect of potassium and sulphur on growth and yield of black gram (*Vigna mungo* L. Hepper) under rainfed condition. Legume Research, 36(3), 255.
[27]. Yadav, V. K. and Singh, S. P. (2005). Losses due to weeds and response to pendimethalin and fluchloralin in varieties of summer sown *Vigna radiate*. Annals of Plant Protection Sciences, 13, 454–457.

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