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Effect of Seed Inoculation and Different Nitrogen Levels on the Grain Yield of Mungbean

Asrar Mahboob and Muhammad Asghar
Agronomic Research Station, Farooqabad, Punjab, Pakistan

Abstract: Effect of seed inoculation and different nitrogen levels on yield and yield components of mungbean was studied at Agronomic Research Station, Farooqabad during the year 2000 and 2001. Results showed that various yield components like No. of pods plant^{-1}, No. of grain pods^{-1}, 1000 grain weight, biological and grain yield were affected significantly by seed inoculation and fertilizer application. Seed inoculation + 50-50-0 NPK kg ha^{-1}, exhibited superior performance for exploiting maximum potential (955 kg ha^{-1}) of mungbean grains.

Key words: Mungbean, NPK fertilizer, inoculation, yield, agronomic characters

Introduction

Mungbean (*Vigna radiata* L.) is an important pulse crop of Pakistan and is popular for its nutritive value and digestibility. Its seed contains 24.2 % protein 1.3 % fat and 60.4 % carbohydrates (Considine, 1982). It is short duration, drought tolerant, can be grown twice a year and fits well in our crop rotation program. In Pakistan annually 200.3 thousand hectares are put under its cultivation and 93.3 thousand tones of yield is gained with an average of 466 kg ha^{-1} (Anonymous, 2000), which is too low. The reasons of this low yield are numerous but nutritional imbalance and poor nodulation, appears to be the distinct one.

Singh *et al.* (1993) maintained that grain yield of mungbean was increased by the application of 20 kg N ha^{-1} and 40 kg P$_2$O$_5$ ha^{-1}, where as K$_2$O application has no significant effect. Sharma and Room (1993) found that application of 25 kg N ha^{-1}, 75 kg P$_2$O$_5$ ha^{-1} and 75 kg K$_2$O ha^{-1} to green gram gave the highest yield of 16.66 q ha^{-1}. They further concluded that yield components were also significantly affected by NPK. Bahlu *et al.* (1995) pointed out in a trial with *Vigna mungo* given 0, 20, 30 kg N and 20, 40, 60 kg P$_2$O$_5$ ha^{-1} and seed inoculated with rhizobium or not inoculated. It was concluded that seed yield increased by seed inoculation, seed yield was also increased when N was applied @ 20 kg ha^{-1}. Patra and Bhattacharyya (1997) observed that highest nodules numbers and seeds yield were obtained by treating the mungbean seeds with rhizobium and applied urea @ 25 kg ha^{-1}. Provorov *et al.* (1998) observed in field trials conducted at Uzbekistan that inoculation of mungbean seeds with Brady rhizobium increased the herbage mass by 6%, seed mass by 3.6 %, mass of 1000 seeds by 0.8%, nitrogen content in seeds by 8.9%, starch content in seeds by 5.5% and number of nodules by 2.54%. Ali *et al.* (2000) inoculated three mungbean varieties with NIBGE inoculant and AARI inoculant and reported that growth and yield components were significantly affected by inoculation. Treatment of seed with NIBGE inoculant (Biopower) gave significantly more seed yield as compare to that with AARI inoculant. Kashem *et al.* (2000) observed that Brady rhizobium inoculation and NPK fertilization increased the grain and straw yields of mungbean significantly and obtained highest grains yield by the treatment 0-30-20 NPK + inoculum. Shivesh *et al.* (2000) observed that seed inoculation + 20 kg P$_2$O$_5$ ha^{-1} to mungbean gave high growth, seed yield and dry matter accumulation. Ashraf (2001) found that number of pods plant^{-1}, no. of seeds pod^{-1} and 1000-grain weight were affected significantly by the application of 50 kg P$_2$O$_5$ with varying level of N from 20 to 50 kg ha^{-1} in addition to seed inoculation. He further studied that highest grain yield of 1074.74 kg ha^{-1} was recorded in plot, fertilized with 50-50-0 kg NPK ha^{-1} + seed inoculation.

It was therefore felt that there is an urgent need to determine the effect of seed inoculation and appropriate level of NPK for getting higher seed production of mungbean under Farooqabad, District Sheikhupura conditions.

Materials and Methods

The present studies were carried out at the Agronomic Research Station Farooqabad, District Sheikhupura for two consecutive years (2000-2001). Experiments were laid out in Randomized complete Block Design having net plot size 3x5 m^2. Mungbean CV. NM-92 was used as a test variety and the treatments used were as follows.

T_1 = No seed inoculation + No fertilizer (control)
T_2 = Seed inoculation alone + No fertilizer.
T_3 = Seed inoculation + 20-50-0 NPK kg ha^{-1}.
T_4 = Seed inoculation + 30-50-0 NPK kg ha^{-1}.
T_5 = Seed inoculation + 40-50-0 NPK kg ha^{-1}.
T_6 = Seed inoculation + 50-50-0 NPK kg ha^{-1}.
T_7 = Seed inoculation + 50-50-25 NPK kg ha^{-1}.

The crop was sown during the Ist fortnight of May and harvested during 2nd week of July. The seeds were inoculated just before drilling. The whole quantity of fertilizers was side dressed just after sowing. All other agronomic practices were kept uniform for all the treatments. Observations regarding various agronomic characteristics were recorded by using standard procedure. Data collected and analyzed statistically by using the analysis of variance technique and Duncan's New Multiple Range test at 5% probability was applied to compare treatment means (Steel and Torrie, 1984).

Results and Discussions

No. of pods plant^{-1}: Seed inoculation and fertilizer application effected significantly on the no. of pods plant^{-1}. In the year 2000 T_7 (seed inoculation + 50-50-25 NPK kg ha^{-1}) gave maximum no. of pods plant^{-1} (19.47) but was statistically at par with T_6 (18.95) (Table 1). Similarly during the year 2001 T_7 produced maximum no. of pods plant^{-1}, nevertheless it was statistically equal to T_4, T_5 and T_6, with minimum no. of pods plant^{-1} in plot applied T_1 (no seed inoculation + no fertilizer) (Table 2). Results are in line with those obtained by Ali *et al.* (2000) and Ashraf (2001).

No. of grains pod^{-1}: Seed inoculation and fertilizer application exhibited a positive effect towards no. grains pod^{-1} (Table 1 and 2). During the year 2000 maximum no. of grains pod^{-1} were noted in plot treated with T_7 which was statistically at par with T_5 and T_6. While minimum no. of grains pod^{-1} were received in case of T_1 (Table 1). In the year 2001 maximum no. of grains pod^{-1} were observed in plot applied with T_6 which was statistically equal to T_3, T_4, T_5 and T_7. Ali *et al.* (2000) and Ashraf (2001) reported similar results.

1000-grain weight (g): Seed inoculation and NPK application significantly affected 1000-grain weight (Table 1 and 2). Maximum 1000-grain weight was recorded in plots having T_6 (41.84 g) and (42.60 g) during both the years with minimum in case of plot

Table 1: Various agronomic characteristics of mungbean as affected by seed inoculation and different fertilizer levels during the year 2000

Treatments	No. of pods plant^{-1}	No. of grains pod^{-1}	1000-grain weight (g)	Biological yield (kg ha^{-1})	Grain yield (kg ha^{-1})
T_1	11.51d	7.007c	36.38e	3556f	343f
T_2	11.98d	6.917c	37.00e	3880e	470e
T_3	13.19Cd	7.150c	38.61d	4019d	520d
T_4	15.01c	8.473b	39.76c	4240c	600c
T_5	17.18b	10.57a	39.98bc	4356b	639b
T_6	18.95ab	10.52a	41.84a	4865a	648b
T_7	19.47a	11.02a	40.83b	4776a	670a
LSD value	1.856	1.143	0.9363	115.9	9.767

Any two means not sharing a letter in common differ significantly at 5% probability level

Table 2: Various agronomic characteristics of mungbean as affected by seed inoculation and different fertilizer levels during the year 2001

Treatments	No. of pods plant^{-1}	No. of grains pod^{-1}	1000-grain weight (g)	Biological yield (kg ha^{-1})	Grain yield (kg ha^{-1})
T_1	16.33c	8.810b	37.74e	3327c	928c
T_2	18.85bc	8.833b	40.69cd	3874b	1104b
T_3	21.01b	10.97a	41.23bc	3903b	1077b
T_4	28.33a	11.34a	41.57b	4085b	1088b
T_5	28.20a	11.28a	40.22d	4085b	958c
T_6	31.12a	12.15a	42.60a	4471a	1262a
T_7	32.67a	11.03a	41.72b	4006b	1073b
LSD value	4.345	1.152	0.7116	282.5	103.5

Any two means not sharing a letter in common differ significantly at 5% probability level

applied T_1. The heavier seed could be because of favorable soil environment and better fertilizer supply, which finally improve the grain weight. Almost similar results were reported by Sharma and Room (1993) and Ali *et al.* (2000).

Biological yield (kg ha^{-1}): Total biomass production per hectare was affected significantly by seed inoculation and fertilizer application. Treatment T_6 produced highest biomass 4865 and 4471 Kg ha^{-1} during the years 2000 and 2001, which was (37%) and (34%) higher than that of control. These results are in agreement with those maintained by Sharma and Room (1993).

Grain yield (kg ha^{-1}): Final grain yield is a function of cumulative effect of various yields parameters. Data reflects that seed inoculation and fertilizer application has a significant affect on grain yield per hectare. During 2000 maximum grain yield (670 kg ha^{-1}) noted in plots applied with T_7 and was followed by T_6 (648 kg ha^{-1}), while the T_1 produced only 343 kg ha^{-1} grains. In the year 2001 T_6 gave maximum grain yield i.e., 1262 kg ha^{-1} and T_7 gave 1073 kg ha^{-1} with minimum in case of control. These results are in conformity with those of reported by Bahlu *et al.* (1995), Patra and Bhattacharyya (1997) and Kasheem *et al.* (2000). The results led to the interference that yield and yield components of mungbean significantly affected by seed inoculation and fertilizer application. T_6 (Seed inoculation + 50-50-0 kg NPK ha^{-1}) and T_7 (Seed inoculation + 50-50-25 kg NPK ha^{-1} exhibited superior performance for exploiting maximum potential of mungbean under Farooqabad conditions.

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