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# Growth and Yield Response of Mungbean (*Vigna radiata* L.) Cultivars to Varying Levels of Nitrogen

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## Abstract

Response of two mungbean cultivars namely NM-54 and NM-92 to nitrogen levels of 0, 20, 40 and 60 kg $ha^{-1}$ was studied under field conditions. The cultivar NM-92 gave significantly higher seed yield than cultivar NM-54 due to higher number of pod bearing branches $plant^{-1}$, number of pods $plant^{-1}$ and number of seeds $pod^{-1}$. Yield and yield components were also influenced significantly by nitrogen levels. The application of nitrogen at the rate of 60 kg $ha^{-1}$ significantly depressed the seed yield and yield components except number of pods plant which were statistically similar with nitrogen application of 40 kg $ha^{-1}$. Maximum increase in seed yield, recorded at 40 kg N $ha^{-1}$, was about 31 percent higher of control. The increase in seed yield with nitrogen application was related to higher number of pods $plant^{-1}$, number of seeds $pod^{-1}$ and 1000-grain weight. Protein contents were also influenced significantly by nitrogen application, being maximum (26.18%) at nitrogen level of 40 kg $ha^{-1}$. Nitrogen application at the rate of 40 kg ha seems to be the optimum level for harvesting higher yield of mungbean.

## Introduction

Mungbean (*Vigna radiata* L.) is one of the roost important Pulses grown in Pakistan. Soils in Pakistan are mainly deficient in nitrogen due to mineralization, leaching and volatilization (Nisar *et al*., 1996).

Patel *et al*. (1984) obtained the highest seed yield with NP application of 20 and 40 kg $ha^{-1}$, respectively. Fertilizer applied above these levels had non significant effect on yield of mungbean. Raju and Verma (1985) reported that seed inoculation and application of 15 to 60 kg N $ha^{-1}$ significantly increased nodulation and seed yield of mungbean. They further found that 50 kg N $ha^{-1}$ was the most effective dose. Hamid (1991) reported that in both field and pot trials 10 mg N $litre^{-1}$ increased seed yield more than higher or lower nitrogen rates. Yield increases were associated with the number of pods $plant^{-1}$ and number of seeds pod rather than the increase in the seed weight. Mumtaz (1996) reported that yield and yield components of mungbean like number of branches $plant^{-1}$, number of pods $plant^{-1}$, number of seeds $pod^{-1}$ and 1000-seed weight were significantly affected by NP application. He obtained the maximum yield with NP application of 100 and 250 kg $ha^{-1}$, respectively. Ahmed *et al*. (1992) reported significant differences among cultivars with regard to number of pods $plant^{-1}$, number of seeds $pod^{-1}$, 100-grain weight, seed yield ha and seed protein contents. Rana (1998) reported that cultivar NM-54 gave significantly higher seed yield than NM-92 due to higher number of pods $plant^{-1}$ and 1000-seed weight.

The present study was, therefore, undertaken to compare the growth and yield performance of two mungbean cultivars and also to determine the most appropriate level of nitrogen for mungbean under agro-ecological conditions of Faisalabad.

## Materials and Methods

The experiment was conducted under field conditions, during the year 1996, on a sandy clay loam soil having 0.085 percent nitrogen, 9.2 PPM available phosphorus and 134 PPM available potassium. The experiment was laid out in randomized complete block design with four replications having a net plot size of 2.4 m x 5 m. Two mungbean cultivars NM-92 and NM-54 were fertilized at rates of 0, 20, 40 and 60 kg N $ha^{-1}$. Phosphorus was applied at a rate of 75 kg $ha^{-1}$ in the form of single superphosphate. The whole quantity of nitrogen and phosphorus was side drilled at sowing time. Crop was sown in the second week of March in 40 cm apart rows with a single row hand drill. The crop was harvested on 2nd of June when about 80% of pods had reached to maturity.

Ten plants from each plot were selected at random to record average number of pod bearing branches $plant^{-1}$, average number of pods $plant^{-1}$ and average number of seeds $pod^{-1}$. From each plot 1000-seeds were counted and weighed to determine the 1000-seed weight. Seed yield obtained from each plot was converted to quintals ha The protein contents in seeds were determined by using Gunning and Hibbard's method of $H_2SO_4$ digestion and using micro kjeldhal method for distillation (Jackson, 1962). Data collected were analyzed statistically using Fisher's analysis of variance technique and the least significant difference test at 0.05 probability level was employed to compare the difference among the treatment means (Steel and Torrie, 1984).

## Results and Discussion

The data regarding various parameters recorded are given in Table 1. Both cultivars produced statistically different number of pod bearing branches $plant^{-1}$. The cultivar NM-92 produced more number of branches plant than cultivar NM-54. These differences can be attributed to genetic traits of crop plants. Ahmed *et al*. (1992) had also reported significant differences among mungbean cultivars. The application of nitrogen fertilizer did not significantly affect the number of pod bearing branches $plant^{-1}$. However, the

Table 1: Response of two mun bean cultivars to different levels of Nitroen

| | No. of pod bearing branches per plant | No. of pods per plant | No. of seed per pod | 1000-seed weight (g) | Seed yield (q ha$^{-1}$) | Seed protein content (%) |
|---|---|---|---|---|---|---|
| **Cultivars** | | | | | | |
| NM.54 | 5.21b | 11.42b | 8.70b | 56.51$^{NS}$ | 9.76b | 22.36b |
| NM 92 | 6.43a | 13.19a | 9.70a | 57.66 | 10.96a | 27.24a |
| **Nitrogen levels (kg ha$^{-1}$)** | | | | | | |
| Control | 5.62NS | 9.88c | 7.66c | 54.34c | 9.49c | 23.85c |
| 20 | 6.02 | 12.06b | 9.01b | 54.85c | 9.44c | 24.12c |
| 40 | 6.34 | 13.44a | 10.80a | 61.89a | 12 42a | 26.18a |
| 60 | 5.68 | 1 3.85a | 9.34b | 57.29b | 10.11b | 25.08b |

Means followed by same letter did not differ significantly at 5% probability level

maximum number of branches plant$^{-1}$ were recorded from plots receiving 40 kg N ha$^{-1}$. The results indicated that nitrogen application has improved the vegetative growth of the plants. Significant effect of nitrogen application on number of branches plant$^{-1}$ have also been reported by Mumtaz (1996).

The cultivar NM-92 produced statistically higher number of pods plant$^{-1}$ (13.19) than cultivar NM-54 which produced 11.42 pods plant$^{-1}$. These differences can be attributed to differences in the genetic make up of the cultivars. These results are in line with those of Rana (1998) who reported significant differences between cuitivars NM-54 and NM-92 for number of pods plant$^{-1}$. The number of pods per plant were also influenced significantly by fertilizer treatments. The plots which were given 60 kg N ha$^{-1}$ remained at par with 40 kg N ha$^{-1}$ but produced the maximum number of pods plant$^{-1}$. The minimum number of pods plant$^{-1}$ were recorded from plots receiving no nitrogen. Significant differences of nitrogen application on the number of pods plant$^{-1}$ have been reported by Hamid (1991) and Mumtaz (1996).

The cultivar NM-92 produced significantly higher number of seeds pod$^{-1}$ as compared to cultivar NM-54. These results are quite in line with those of Ahmed *et al*. (1992). Various nitrogen levels also produced significant differences on the number of seeds pod$^{-1}$. The application of nitrogen at the rate of 40 kg ha$^{-1}$ produced significantly higher number of seeds pod (10.80) than all other treatments. The crop raised with the application of 20 and 50 kg N ha$^{-1}$ produced statistically similar number of seeds pod$^{-1}$ but significantly higher than control. Significant increase in number of seeds pod$^{-1}$ with the application of nitrogen has also been reported by Hamid (1991) and Mumtaz (1996). Both cultivars produced statistically similar 1000-seed weight and the weights recorded were 56.51 g and 57.66 g for cultivar NM-54 and NM-92 respectively. The results are in agreement with those of Ahmed *et al*. (1992) and Rana (1998). Various nitrogen levels also differed significantly from one another regarding 1000-seed weight. The plots fertilized at the rate of 40 kg N ha$^{-1}$ produced significantly higher 1000-seed weight (61.89 g) than all other nitrogen levels. The differences between control and 20 kg N ha$^{-1}$ were not significant. Mumtaz (1996) has also reported significant effect of nitrogen application on 1000-seed weight. But Hamid (1991) reported non-significant effect of nitrogen application on 1000-seed weight.

The cultivar NM-92 produced significantly higher seed yield than cultivar NM-54. The higher seed yield of cultivar NM-92 was due to higher number of pods plant number of seeds pod$^{-1}$ and 1000-seed weight. Ahmed *et al*. (1992) and Rana (1998) have also reported significant difference among the cultivars for seed yield. The differences in seed yield among the various nitrogen levels were also significant. The crop grown with the application of 40 and 60 kg N ha$^{-1}$ produced significantly higher seed yield than control and 20 kg N ha$^{-1}$. The differences between 40 and 60 kg N ha$^{-1}$ were also significant. The minimum (9.44 q ha$^{-1}$) and maximum (10.11 q ha$^{-1}$) seed yield was obtained from plots receiving no nitrogen and crop grown with 40 kg N ha$^{-1}$, respectively. Significant effects of nitrogen application on seed yield of mungbean have been reported by Raju and Verma (1985), Hamid (1991) and Mumtaz (1996). The cultivar NM-92 gave significantly higher protein contents (27.24%) than NM-54 (22.36%). These differences can he attributed to differences in genetic make up of varieties. Significant differences among varieties for protein contents have also been reported by Ahmed *et al*. (1992). The crop grown with the application of 40 kg N ha$^{-1}$ gave significantly higher protein contents than all other treatments. The differences between control and 20 kg N ha$^{-1}$ were not significant. The increase in protein contents with nitrogen application may be due to the reason that nitrogen application has enhanced amino acid formation in the seed.

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