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Effect of calcium and sulphur on the growth and yield of mungbean [*Vigna radiata* (L.) Wilczek]

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SUMMARY

The effect of calcium and sulphur was studied on plant height (cm), number of leaves, leaf area (sq.cm.), dry weight, number of pods, yield of seed per plant and 1000 seeds weight of mungbean (*Vigna radiata* L.) var. PDU-54 and PU-44. The experiment was conducted at C.C.R. (P.G.) College, Muzaffarnagar, (U.P.) during the years 2002-2003. Simple Randomized Block Design was followed with 4 concentrations of calcium, 4 concentrations of sulphur along with control and 4 replications. The doses of calcium were 25ppm, 50ppm, 100ppm and 200ppm. The concentrations of sulphur were 25ppm, 50ppm, 75ppm and 100ppm. The results were found significant for both the varieties of mungbean.

Key words : Calcium, Sulphur, Mungbean (*Vigna radiata*), $ZnSO_4$, Mg, Chlorophyll

India is a major pulse growing country in the world and shares approximately 38-40% area under cultivation and 29-30% total production at world level.

Mungbean is generally grown in summer and *Kharif* seasons in U.P. The yield of mungbean in *Kharif* season is very low due to the attack of yellow mosaic virus (Y.M.V.).

Pandey and Singh (2000) studied the growth pattern in relation to yield in mungbean (*Vigna radiata* (L.) Wilczek). To elucidate the nature of growth pattern in relation to yield in mungbean, 10 diverse genotypes were planted in summer and *Kharif* at Meerut (Uttar Pradesh) under two environments, with (20N:40P:40K) and without fertilizers. Data on plant height at flowering and harvest, and harvest index were recorded. It was concluded that early vegetative growth has no direct impact on grain yield, and that plant height at and after flowering should receive attention as selection criteria. The results are contrary to the concept of completion between foliar development and grain, indicating that vigorous growth after anthesis should be encouraged. The correlation between total plant dry matter and grain was significant. Further, the coefficient of determination shows that the contribution of total plant dry matter to gain yield was 50% in *Kharif* season and 20% in summer season. These findings suggest that in order to attain maximum grain yield, vigourous plant growth is a prerequisite.

Besides, asynchronous flowering, maturity and shedding of flowering buds, there are also some of the important factors resulting in the low productivity of pulses. This situation could be improved if the cultivation of these crops becomes more remunerative in comparison to cereal crops and simultaneously by adopting in innovative breeding strategy. For instance, by working out the genetic architecture pertaining to these traits for breeding ideal genotypes, which may help in increasing the pulse production and productivity significantly. Considerable variation for productivity exists between important pulses growing countries in the region. In order to ensure "household nutritional security". As per recommendation of the International Conference on Nutrition (ICN), concerted efforts are needed at this stage to improve further the quality and productivity of pulse crops in most of the pulse growing countries as Asia (Paroda, 1994).

MATERIALS AND METHODS

The seeds of mungbean cv. PDM-54 and PU-44 were obtained from I.I.P.R. (Indian Institute of Pulse Research), Kalyanpur, Kanpur. The experiments were conducted in Randomized Block Design with four replications at C.C.R. (P.G.) College, Muzaffarnagar (U.P.) during the years 2002-2003. Four concentrations of calcium and four concentrations of sulphur along with control were taken. The solutions of calcium and sulphur were sprayed fortnightly after one month of sowing the crop. The concentrations of calcium were 25ppm, 50ppm, 100ppm and 200ppm while the concentrations of sulphur were taken as 25ppm, 50ppm, 75ppm and 100ppm.

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Symbols of treatments:

T_1 – 25ppm Ca, T_5 – 25ppm S, T_2 – 50ppm Ca, T_6 – 50ppm S, T_3 – 100ppm Ca, T_7 – 75ppm S, T_4 – 200ppm Ca, T_8 – 100ppm S, T_9 – control (c)

The growth and yield characters studied were height (cm)/plant, number of leaves/plant, leaf area (sq.cm.)/ plant, dry weight (g)/plant, number of pods/plant, seed yield/plant and test weight (1000 seeds weight). The observations were recorded from 3 plants and then averaged for each treatment.

The height (cm) was measured with meter scale and leaf area was calculated with the help of planimeter. The data were statistically analysed. The results of the recorded observations were interpreted with the help of critical difference (C.D.) at 5% level of significance.

RESULTS AND DISCUSSION

The results regarding the effect of calcium and sulphur on growth and yield characters in mungbean cv. PDM-54 AND PU-44 are presented in Tables 1 and 2.

In mungbean var. PDM-54 plant height was observed 63.00cm in T_4 while in T_9 (control) it was recorded 58.3 cm in 2003. Similar results were found in var. PU-44 as T_4 showed 57.3cm and T_9 (control) 52.3 cm in 2003. PDM-54 was superior than PU-44 in height per plants.

The height in mungbean var. PDM-54 was found 60.3cm in T_6 while it was 51.6cm in T_8 treatment. Similar trend was recorded in PU-44 in 2003.

Yang *et al*. (2001) reported alleviation effect of different ratio of Al to Ca on Al toxicity for morphological growth of mungbean seedling. Treatments with Al and Ca increased root length (4%), seedling height (5%), fresh weight (15%) and dry weight (5%).

The effect of calcium from T_1 to T_4 increased the height of mungbean plants because calcium promotes the growth attributes of plants. T_5 to T_6 with sulphur also increased the height but due to toxic effect of T_8 reduced the height. Sulphur ions accumulation retards the growth *i.e.* height.

Number of leaves, leaf area (sq.cm.), dry weight

Table 1: Effect of different concentrations of calcium on growth and yield characters of mungbean

PDM-54	Height (cm)/plant	No. of leaves/plant	Leaf area (sq.cm.)/plant	Dry weight (g)/plant	No. of pods/plant	Yield of seed/ plant	1000 seeds weight
T_1	58.3	49.1	914	60.2	72.5	87.6	54.9
T_2	60.0	50.0	923	61.2	73.8	88.7	55.6
T_3	61.6	50.8	929	62.4	75.6	89.8	56.4
T_4	63.0	51.6	935	63.4	76.9	90.6	56.9
T_9 (C)	58.3	46.8	904	59.4	70.8	85.8	53.8
PU-44							
T_1	53.3	46.6	847	57.7	67.8	81.8	53.8
T_2	55.0	47.9	854	58.8	69.5	82.9	54.4
T_3	56.3	48.3	860	59.7	70.8	84.5	54.9
T_4	57.3	48.9	865	60.4	71.6	85.6	55.4
T_9 (C)	52.3	45.3	845	57.1	66.7	80.6	53.0

Table 2: Effect of different concentrations of sulphur on growth and yield characters of mungbean

PDU-54	Height (cm)/plant	No. of leaves/plant	Leaf area (sq.cm.)/plant	Dry weight (g)/plant	No. of pods/plant	Yield of seed/ plant	1000 seeds weight
T_5	58.3	47.5	912	73.4	72.9	87.9	55.4
T_6	60.3	49.5	922	74.8	73.8	89.0	55.9
T_7	55.0	46.0	906	72.1	70.5	86.3	54.4
T_8	51.6	44.0	898	71.1	68.7	85.4	53.8
T_9 (C)	58.3	46.8	904	70.1	70.8	85.8	53.8
PU-44							
T_5	53.3	46.4	845	57.7	68.6	86.4	53.3
T_6	56.0	47.7	853	58.6	69.0	87.3	53.9
T_7	49.3	44.5	838	56.0	66.3	80.6	53.2
T_8	46.6	42.1	831	55.3	65.9	79.6	52.8
T_9 (C)	52.3	45.3	845	57.1	66.7	80.6	53.0

(g)/plant and number of pods per plant showed similar results as that of height/plant. T_4 increased maximum above growth parameters but T_8 reduced all the parameters due to toxic effect of sulphur in mungbean. Number of leaves/plant were also increased to promote growth. Prasad and Srivastava (2001) studied the yielding ability in mungbean. Maximum number of leaves, leaf area and dry weight accumulation were recorded between 30-60 DAS. Calcium promotes growth while higher concentrations of sulphur reduces the number of leaves.

In mungbean 90.6 and 85.6(g) seed yield/plant was found in PDM-54 and PU-44, respectively in 2003. The effect of sulphur on seed yield/plant has been shown in Table 2. T_6 produced maximum seed yield/plant and T_8 produced minimum in both varieties of mungbean.

Similar results were found in 1000 seeds weight in calcium and sulphur treatments in mungbean var. PDM-54 and PU-44 in 2003 (Table 1 and 2)

Mehta and Singh (1981) studied the response of greengram to sulphur application of elemental S increased seed yield by 75%. Thandapani (1989) reported that N, P, K, Ca and Mg in greengram at different growth stages increased the seed yield.

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