

Effects of calcium and sulphur on chlorophyll and protein contents of mungbean [*Vigna radiata* (L.) Wilczek] and urdbean [*Vigna mungo* (L.) Hepper]

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Accepted : October, 2009

SUMMARY

The present experiment was conducted at C.C.R.(P.G.) College, Muzaffarnagar (U.P.) in the year 2002-2003. Simple RBD was followed with 4 concentrations of Ca and 4 concentrations of S along with control and 4 replications. The doses of calcium were 25, 50, 100, and 200 ppm and sulphur were 25, 50, 75, and 100 ppm. The results were found significant for both the varieties of mungbean and urdbean.

Key words : Calcium, Sulphur, Mungbean, *Vigna radiata*, Urdbean, *Vigna mungo*, Chlorophyll and protein contents

Mungbean and urdbean are generally grown in summer and *Kharif* seasons in Uttar Pradesh. Mungbean and urdbean are the second largest protein producing pulse crop of the world where as Soybean and groundnut rank first position. Since they contain 23-25% protein in their grain, they could provide an answer to the problem of protein deficiency as well as protein malnutrition (Rosario *et al.*, 1980).

The residual effect of lime and micronutrients under a rotation of soybean, rice and cowpea was studied. The treatments were 0, 2, 3 and 5 t/ha of lime and 3to5 t/ha of lime plus micronutrients. Significant increase in yield were obtained with lime and micronutrients (Alfaia and Murako, 1998).

The deficiency of calcium appears in the young leaves and near the growing points of stem and root. Margins of the leaves often appear irregular in form or often show brown scorching or spotting effects. The younger leaves may be severally distorted with the tips hooked back and the margins curled backward or forward or rolled. Sulphur deficient plants show symptoms similar to nitrogen deficiency. Marked decrease in leaf size and general paling with red or purple pigmentation is seen. Necrosis of young leaf tips and margins, leaves remain small and turn pale *i.e.* symptoms of chlorosis develop. Leaf fall is rapid and fruit formation is suppressed.

MATERIALS AND METHODS

The present trials were conducted at C.C.R. (P.G.) collage, Muzaffarnagar (U.P.) during the years 2002-2003. The seeds of urdbean var. PDU-1 and PU-19 and mungbean var. PDM-54 and PU-44 were obtained from I.I.P.R. Kanpur. The seeds were pre-soaked in different concentrations of calcium and sulphur for 12 hours. They were washed thoroughly with tap water and were sown in petridishes for germination test. The seeds (untreated) were sown directly in the plots. R.B.D. was followed with four replications. After 30 days of sowing the crop was sprayed with different concentrations of calcium and sulphur solutions.

The concentrations of calcium and sulphur were recorded as 25ppm, 50ppm, 100ppm, for calcium, 25ppm, 50ppm, 75ppm, and 100ppm, for sulphur.

Symbols of treatments:

T ₁ – 20ppm 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)

Determination of total chlorophyll:

The chlorophyll content in fresh leaves was determined according to Arnon (1949). The procedure for chlorophyll determination was based on the work of Mac. Kinney (1941), on the absorption of light by aqueous acetone (80%) extract of chlorophyll organic solvent 4:1 acetone alcohol was used.

0.5g fresh leaves of control and treated plants were taken with organic solvent (Aceton 80%) in clean specimen tubes. The extracts were centrifuged at 3000 rpm for 15 minutes and the volume was made upto 25 ml of each sample by adding more organic solvent.

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Spectra - 20 at Botanical department, C.C.R.(P.G.) college, Muzaffarnagar was used for the estimation of chlorophyll content and the observations of total content were recorded on , 645, 652 and 663 wave length, respectively.

Total chlorophyll content was calculated by using the following formula (Arnon 1949).

$$C = 20.2 D_{645} + 8.02 D_{663} \text{ in mg/g dry weight}$$

Estimation of total nitrogen and protein:

Nitrogen % and amount of protein content synthesized by the plant tissues were determined according to Jakson (1958) and Misra (1968). 500mg well dried and powdered plant material was taken in 50 ml kjeldahl flask with 5 ml of conc. H_2SO_4 , 0.1g catalyst mixture of copper sulphate, potash sulphate and selenium dioxide in the ratio of .1:8:1, respectively was also added.

After digestion, the volumes were made upto 50 ml. distillation was done in a Markham apparatus as described by Jakson (1958) and Mishra (1968).

$$\text{The nitrogen \%} = (T-B) \times 5 \times N \times (1.4/S)$$

where,

T = Volume of HCl (Standard acid used in actual titration)

B = Blank

N = Normality of HCl = (N/10)

1.4 = Constant

S = Dry weight of plant sample in g.

The difference (T-B) was multiplied by 5 because only 10 ml digested material out of 50 ml was distilled.

The protein content was determined by multiplying total nitrogen by 6.25.

RESULTS AND DISCUSSION

The results obtained from the present investigation are presented in Table 1 and 2.

The results regarding the effect of calcium and sulphur on chlorophyll and protein content of mungbean and urdbean var. PDU-54 and PU-44, PDU-1 and PU-19, respectively are presented in Table 1 and 2. The effect of calcium from T_1 to T_4 increased the chlorophyll and protein contents in both crops. The effect of sulphur was found toxic of T_7 and T_8 in mungbean and urdbean. The results of this finding are similar to the following research workers

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.

Table 1 : Effect of different concentrations of calcium and sulphur on mean chlorophyll content (mg/g dry weight) in urdbean and mungbean

Treatments	2002	2003	2002	2003
	Urdbean	Mungbean	Urdbean	Mungbean
PDU - 1			PDM - 54	
T_1	25.00	25.20	22.70	22.75
T_2	25.50	25.70	23.20	23.25
T_3	26.00	26.20	23.70	23.80
T_4	26.60	26.80	24.15	24.26
T_5	25.60	25.72	23.00	23.20
T_6	26.20	26.28	23.25	23.45
T_7	24.75	24.80	22.40	22.45
T_8	24.50	24.80	22.00	22.00
$T_9(C)$	24.50	24.60	22.20	22.20
PU - 19			PU - 44	
T_1	26.80	26.83	21.80	21.86
T_2	27.30	27.34	22.25	21.30
T_3	27.80	28.10	22.70	22.77
T_4	28.20	28.40	23.10	23.30
T_5	27.40	27.46	21.45	21.55
T_6	27.70	27.76	21.60	21.65
T_7	26.30	26.40	21.20	21.26
T_8	26.00	26.10	21.00	21.10
$T_9(C)$	26.20	26.20	21.40	21.40

Table 2 : Effect of different concentrations of calcium and sulphur on mean protein content percentage in urdbean and mungbean

Treatments	2002	2003	2002	2003
	Urdbean	Mungbean	Urdbean	Mungbean
PDU - 1			PDM - 54	
T_1	15.50	15.56	14.72	14.87
T_2	15.56	15.62	14.87	14.93
T_3	15.62	15.68	15.00	15.06
T_4	15.75	15.81	15.12	15.18
T_5	15.56	15.62	14.87	14.93
T_6	15.62	15.68	14.93	13.00
T_7	15.37	15.43	14.75	15.81
T_8	15.31	15.37	14.87	14.68
$T_9(C)$	15.40	15.40	14.72	14.72
PU - 19			PU - 44	
T_1	15.50	15.62	14.52	14.62
T_2	15.63	15.68	14.62	14.68
T_3	15.75	15.81	14.75	14.81
T_4	15.81	15.87	14.81	14.87
T_5	15.62	15.68	14.62	14.68
T_6	15.68	15.75	14.68	14.75
T_7	15.43	15.50	14.43	14.50
T_8	15.37	15.43	14.37	14.43
$T_9(C)$	15.50	15.50	14.52	14.52

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