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Growth of summer greengram (*Vigna radiata* L.) As influenced by foliar nutrition under south Gujarat condition

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Abstract
A field experiment was conducted during summer season of 2019 at the College Farm, Navsari Ag ricultura l University, Navsari, to study the effect of foliar nutrition on growth of summer greengram (*Vigna radiata* L.) under south Gujarat condition. The soil of the experimental field was clayey in texture with low in available nitrogen, medium in available phosphorus, potassium and slightly alkaline in reaction with normal electrical conductivity. The experiment was laid out in rando mized block design with three replications and total ten treatments. The results revealed that green gram variety GM –6 with foliar application of 2% DAP twice at branching stage and pod initiation stage was beneficial to increase all growth parameters like plant height, number of branches per plant, dry matter accumulation plant over the control. However days to 50% flowering and days to maturity remained unaffected due to foliar spray of nutrients.

Keywords: greengram, foliar spray of nutrition, DAP, MAP, novel organic liquid

Introduction

Greengram (*Vigna radiata* L.) is an important pulse crop of India. It is warm weather crop and cultivated in all the three growing season in various parts of the country. Greengram belong to family *leguminoseae* and sub family *papilionaceae*. Greengram is supposed to be native of India and central Asia. From India, the crop spreads to China, Iraq, Japan, Africa etc. Total area contributed to green gram was 40.70 million hectare and total production of green gram was 19.01 million tones and total yield of green gram was 426 kg/ha in India in year 2017 - 2018. (Anonymous, 2017-18) [1]. Green gram is a good source of high quality protein. It contains about 25% protein, 1.3% fat, 3.5% minerals, 4.1% fiber and 56.7% carbohydrate (Panchal, 2015) [9]. The protein content of greengram is two to three times more than that of cereals. Greengram is consumed as whole grains as well as dal in a variety of ways in homes. Sprouted whole greengram is used in preparing curry or savoury dish. It is used mostly as dal in northern India. *Mung* halva is very nutritious. It is supposed to be easily digestible and hence it is preferred for patients.

Soil applied fertilizers are subjected to different losses like leaching losses, volatilization, fixation, etc. Foliar application of nutrients along with soil application has several advantages in supplementing the nutritional requirements of crops. Although, greengram is a nitrogen fixing crop but phosphorus management is an issue in nutrient management. The requirement of phosphorus in greengram is higher as compared to nitrogen in regard to artificial application of nutrients. Also the availability of applied phosphorus to the crop has much more hurdle as, large portion of the applied phosphorus gets fixed in soil reducing its availability to the crop. Phosphorus is the major essential element required by the crop. Phosphorus stimulates early root development, enhances the availability of Rhizobia and increases the formation of root nodules thereby fixing more atmospheric nitrogen. Legumes as such have a relatively high phosphorus requirement being utilized by plant and bacteria. Under these circumstances foliar application may be promising for ensuring use efficiency of applied nutrients. The use efficiency of foliar applied fertilizers is much higher than of soil application.

Foliar fertilization is gaining importance in plant nutrition these days. The foliar applied nutrients are more effective as compared to soil applied nutrients. Because of higher uptake efficiency, foliar supply of nutrients can increase photosynthetic efficiency by delaying the onset of leaf senescence (Yadav and Choudhary, 2012) [13]. Foliar application of nutrients is considered to be an efficient and economic method of supplementing the nutrient requirement of the crop which in turn leads to enhanced yield. In addition, foliar application of nutrients was found to be more advantageous than soil application with the elimination of losses through leaching and fixation. It thus increases photosynthetic rate and nutrient translocation from the leaves to the developing seeds (Manomani and Srimathi, 2009) [6]. When availability of moisture becomes scarce, application of fertilizers through foliar spray results in efficient absorption. Though foliar spray is not a substitute to soil application, it can certainly be considered as a supplement to soil application (Upadhyay *et al*., 1992) [12]. Foliar feeding is often the most effective and economical way to improve plant nutrient deficiency (Dixit and Elamathi, 2007) [2]. Moreover, foliar feeding practice would be more useful in early maturing crops, which could be combined with regular plant protection programmes. If foliar nutrition is applied, it also reduces the cost of cultivation due to minimum amount of fertilizer requirement, reduces losses and also economizes crop production (Rao *et al*., 2016) [11].

Keeping a foreside in view, this research was conduct at College farm, NMCA, Navsari Agricultural University, Navsari, Gujarat.

Materials and Methods

The field experiment was conducted during the summer season of the year 2019 at College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat.

The soil of the experimental field was clayey in texture with low in available nitrogen (181.28 kg/ ha), medium in available phosphorus (37.40 kg/ ha), potassium (271.52 kg/ ha) and slightly alkaline in reaction with normal electricalc ond uctivity. The experiment was laid out in randomized block design with three replications and total ten treatments *viz*.,T_1 : Control, T_2 : 2% DAP at branching stage, T_3 : 2% DAP pod initiation stage, T_4 : 2% DAP twice at branching stage and pod initiation stage, T_5 : 1% MAP (12:61:00) at branching stage, T_6 : 1% MAP (12:61:00) at pod initiation stage, T_7 : 1% MAP (12:61:00) twice at branching stage and pod initiation stage, T_8 : 1% Novel organic liquid at branching stage, T_9 : 1% Novel organic liquid at pod initiation stage and T_{10} :1% Novel organic liquid at branching stage and pod initiation stage. Greengram variety was sown with spacing of 30 cm x 10 cm on 18th February and harvested on 20thMay, 2019. Other cultural practices and plant protection measures were taken as per r eco mmend ed io ns. The data on seed and stover yield recorded from net plot and converted on hectare basis. The data were analyzed statistically by adopting the standard procedures described by Panse and Sukhatme (1985) [10]. The purpose of analysis of variance was to determine the significant effect of treatments on greengram.

Results and Discussion

Growth Attributes

Periodical plant height, number of branches per plant, dry matter prod uction per plant, days to 50% flower ing and days to maturity in (Table 1) were significantly influenced by different foliar nutrition treatments, except for initial growth days. Significantly the taller plant height at harvest (48.80 cm) was registered with the application of (T_4) 2% DAP twice at branching stage and pod initiation stage over control, which was at par with application of 1% Novel organic liquid twice at branching stage and pod initiation stage (T_{10}: 46. 31 cm), 1% MAP (12:61:00) twice at branching stage and pod initiation stage (T_7: 46.20 cm), 1% MAP (12 :61:00) at pod initiation stage (T_6: 43.57 cm) and 2% DAP at pod initiation stage (T_3:44.92 cm), and The lowest plant height at harvest (39.95 cm) was recorded under control (T_1). The increase in plant height might be due to applicatio n of recommended dose of fertilizer s as basal provide well nutrition to crop from the initial period of growth along with foliar nutrition received by plants that may have ultimately resulted in better crop establishment and root and shoot growth. Moreover, phosphoro us is an important constitute of energy transfer during certain metabolic process of plant and directly affect plant height of crop. Foliar application of nutrients at a critical crop growth stage (branching and pod initiation stage) helps to regulating the cell division and multiplicatio n as well as cell elongation and development of leaves and other plant' s part. It also helps in enhance the synthesis of carbo hydrates and protein in plants and ultimately the photosynthetic activity resulting in better develop ment of plant growth. Similar results are in accordance with the findings of Krishnaveni *et al.* (2013) [3] and Kumar *et al*. (2013) [4] with respect to plant height.

In case of number of branches per plant (Table 1) of an applicatio n 2% DAP twice at branching stage and pod initiation stage (T_4) gave significantly higher number of branches per plant at 40 DAS (3.50) and at harvest (4.61) over control, which remained at par with 1% Novel organic liquid twice at branching stage and pod initiation stage (T_{10}) 40 DAS (3.25) and at harvest
(3.93), 1% MAP (12:61:00) twice at branching stage and pod initiation stage (T_7) 40 DAS (3.30) and at harvest (4.02) and 2% DAP at branching stage (T_2) 40 DAS (3.43) and at harvest (4. 03).

This might be due to optimum application of fertilizer (RDF) as basal dose, boost up the crop
growth from initial and when it combined with foliar spray of nutrition at pre flowering stage, it increased the level of primary nutrients which would have promoted the axillary bud in to new shoots assures the quick and easy availability of essential plant nutrients resulted in better crop growth in terms of number of branches per plant. Days to 50% flowering and days of maturity a perusal of data in Table 1 indicate non- significant trend for days to 50% flowering in greengram due to various treatments. These findings are substantiated with those reported by Parasuraman (2001) [8] and Kumar *et al*. (2018) [5].

Dry matter production per plant was significantly affected at 40 DAS and at harvest by different foliar nutrition treatments application. Significantly the lowest dry matter production 40 DAS (10.43 g) and at harvest (21.67 g) was observed in control (T_1), whereas the highest dry matter production at 40 DAS (14.86 g) and at harvest (27.59 g) was recorded with the applicatio n of 2% DAP twice at branching stage and pod initiation stage that remained at par with treatment (T_{10}) 1% Novel organic liquid twice at branching stage and pod initiation stage, (T_7) 1% MAP (12:61:00) twice at branching stage and pod initiation stage and (T_3) 2% DAP at pod initiation stage. It might be due to the cumulative effect of an increased availability of nutrients with application of foliar nutrients spray at critical crop growth stage coupled to soil based RDF applicatio n helping in improved the crop growth in terms of plant height and number of branches per plant ultimately resulted in higher dry matter production. The present findings are within the close vicinity of those reported by Muthal *et al*. (2016) [7].

From these findings it can be concluded that foliar application of 2% DAP twice at branching and pod initiation stage may be done in greengram along with recommended dose of fertilizer (20-40 NP kg/ ha) for obtaining profitable growth of greengram crop.

Table 1: Effect of different foliar nutrition treatments on growth attributes of greengram

Treatments	Plant height (cm)			Number of branches per plant			Days to 50% flowering	Days to maturity	Dry matter production per plant (g)		
20 DAS	40 DAS		At harvest	20 DAS	40 DAS	At harvest	-	-	20 DAS	40 DAS	At harvest
T1	8.47	23.97	39.95	0.32	2.90	3.10	39.33	67.67	1.12	10.43	21.67
T2	8.80	24.53	42.02	0.40	3.43	4.03	40.67	69.00	1.16	12.83	23.55
T3	9.13	25.73	44.92	0.43	3.03	3.87	39.67	69.68	1.18	13.47	25.22
T4	9.66	26.80	48.80	0.46	3.50	4.61	41.00	70.33	1.23	14.86	27.59
T5	8.53	24.43	41.37	0.38	3.09	3.33	39.33	66.67	1.73	13.15	22.31
T6	8.80	24.50	43.57	0.34	2.98	3.50	40.68	69.00	1.15	13.23	23.42
T7	9.03	25.80	46.20	0.40	3.30	4.02	41.00	69.00	1.18	13.87	25.52
T8	8.76	24.60	40.91	0.39	2.93	3.23	38.68	70.00	1.15	12.93	23.15
T9	9.00	24.53	42.37	0.36	2.83	3.57	40.00	67.66	1.16	13.03	23.93
T10	9.23	25.80	46.31	0.40	3.25	3.93	40.00	69.67	1.20	14.07	25.51
S Em.±	0.48	1.21	1.80	0.02	0.15	0.24	1.54	2.18	0.43	0.53	1.12
CD (P=0.05)	NS	NS	5.36	NS	0.44	0.72	NS	NS	NS	1.59	3.32
CV%	9.44	8.42	7.16	8.27	8.21	11.28	6.65	5.51	6.46	7.07	8.01

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