International Journal of Applied and Pure Science and Agriculture
ISSN Online - 2394-5532 Impact Factor : 4.446 by SJIF ISSN Print - 2394-823X

EFFECT OF NUTRIENTS ON FOLIAR DISEASES FOR MEASUREMENTS OF GROWTH PARAMETERS AGR, CGR AND NAR IN BLACKGRAM.[*VIGNA MUNGO* (L.)HEPPER].

Akshata. S. Patil[1] and Dr.C.M.Nawalagatti[2]
[1,2] The department of Crop Physiology, University of Agricultural Sciences, Dharwad-580 005, Karnataka, India.

Abstract

Pulses contain atleast two to three times higher proteins compared to cereal grains. India is the largest producer and consumer of pulses in the world.Black gram is the third most important pulse crop in India. It is an ancient and well known leguminous crop of Asia and commonly called as Urdbean. It is popular because of its nutritional quality and suitability for multiple cropping systems.Growth parameters help to understand the pattern of crop growth and development as affected by the cercospora leaf spot and powdery mildew. The absolute growth rate (AGR), crop growth rate (CGR) and net assimilation rate (NAR) are the important growth parameters influencing yield potential which are the dependent on genotype and environment. all the growth parameters differed significantly at both stages and the parameters were significantly higher in treatment with $MnSO_4$,and its combinations, $FeSO_4$ combinations and $MgSO_4$ compared to control.

Key words- AGR, CGR and NAR $MnSo_4$, $MgSO_4FeSO_4$ and urdbean.

I. INTRODUCTION

Pulses form an integral part of Indian Agriculture because of their vital role in enriching human diet as well as soil fertility. Being rich in protein, pulses occupied an extremely wide area of utilization ranging from human foods to industrial products and animal feed. Pulses contain atleast two to three times higher proteins compared to cereal grains. India is the largest producer and consumer of pulses in the world. However, the domestic demand for consumption is much larger than its production. Pulses are known to improve the physical characteristics nutrient status biological nitrogen fixation, which is economically sound and environmentally acceptable (Anon., 2000).

India is one of the major pulse growing countries of the world, with a total area of 239.3 lakh ha and a production of 153.1 lakh tons with an average yield of 605 kg per ha. It is estimated that the pulse requirement by 2020 AD would be minimum of 30.3 million tonnes. The productivity of pulses in India is as low as 650 kg per ha as compared to 4769 kg per ha in France and world average of 900 kg per ha (Anon., 2000).

Black gram is the third most important pulse crop in India. It is an ancient and well known leguminous crop of Asia and commonly called as Urdbean. It is popular because of its nutritional quality and suitability for multiple cropping systems. Being a pulse crop, it helps greatly in improving the fertility of the land, by way of addition of nitrogen to soil during its growth period and makes soil richer. It is a fast growing crop and fits best in rotation and mixed cropping system (Birbal,B. andSingh, P. S., 2015).

II. MATERIALS AND METHODS

Blackgram is a versatile crop and has become more popular among the farmers of northern Karnataka. But in recent past, due to the occurrence of cercospora leaf spot and powdery mildew disease during initiation of flowering causes considerable loss in blackgram (DU-1) seed yield. Though, the foliar application of fungicides control the disease, it is cost expensive and hazardous in nature.

The experimental site consisted of medium black clay loam soil. Composite soil samples were collected from the experimental site and analysed for various physical and chemical properties.

Treatment details

Foliar spraying of micronutrients was done at after 30 DAS after sowing.

Genotype : DU-1
Treatments : Twelve
Replications : Three

T_1- Foliar application of KNO_3 (0.5%)
T_2- Foliar application of $MnSO_4$ (0.3%)
T_3-Foliar application of $ZnSO_4$ (0.3%)
T_4- Foliar application of $MgSO_4$ (0.5%)
T_5-Foliar application of H_3BO_3 (0.2%)
T_6- Foliar application of $CuSO_4$ (0.2%)
T_7-Foliar application of $FeSO_4$ (0.3%)
T_8.-Foliar application of $MnSO_4$ (0.3%) + $CuSO_4$ (0.2%)
T_9-Foliar application of $ZnSO_4$ (0.3%) + $FeSO_4$ (0.3%)
T_{10}- Foliar application of H_3BO_3 (0.2%) + $CuSO_4$ (0.2%)
T_{11}- Foliar application of KnO_3 (0.5%) + $FeSO_4$ (0.3%)
T_{12}-Control (unsprayed).

Design and layout

Gross plot size =4 m × 2. 4 m
Net plot size = 3.8 × 1.8 m

Growth parameters

Absolute growth rate (AGR)

It expresses the dry weight increase per unit time and calculated by using the following formula and expressed as grams plant^{-1} day^{-1} (Radford, 1967).

$$AGR = \frac{W_2 - W_1}{t_2 - t1}$$

Where,

W_2 and W_1 are the total dry weights per plant at time t_2 and t_1, respectively.

Crop growth rate (CGR)

Crop growth rate is the rate of dry matter production per unit ground area per unit time (Watson, 1952). It was calculated by using the following formula and expressed as g m^{-2} day^{-1}

$$CGR = \frac{W_2 - W_1}{t_2 - t1} \times \frac{1}{P}$$

Where,

W_1 = Dry weight of the plant (gm^{-2}) at time t_1
W_2 = Dry weight of the plant (gm^{-2}) at time t_2
$t_2 - t_1$ = Time interval in days
P = Unit land area (m^2)

Net assimilation rate (NAR)

Net assimilation is the rate of dry weight increase per unit leaf area per unit time. It was calculated by following the formula of Watson (1952) and expressed as g dm^{-2} day^{-1}.

$W_2 - W_1$ Log L_2 – LogL_1

NAR = --------------- × ------------------------

$t_2 - t1$ $t_2 - t1$

Where,

L_1 and W_1 = Leaf area (dm^2) and dry weight of plant (g), respectively at time t_1.

L_2 and W_2 = Leaf area (dm^2) and dry weight of plant (g), respectively at time t_2.

t_2 and t_1 = time interval in days.

III. RESULTS AND DISCUSSION

Absolute growth rate (g plant^{-1} day^{-1})

The data (Table 1) on AGR indicated that is increased as crop advances from 40 to 80 DAS.). The data revealed significant differences for AGR values among the nutrient treatments at both the stages.

During 40-60 DAS, the nutrient application of $MnSO_4$ (0.3%) recorded significantly higher AGR (0.201), which was on par with $MnSO_4$ (0.3%) + $CuSO_4$ (0.2%). Significantly lower AGR values were found in control as compared to other treatments (0.118). During 60-80 DAS, $MnSO_4$ (0.3%) had the highest AGR values (0.289), is followed by $ZnSO_4$ (0.3%) + $FeSO_4$ (0.3%) (0.266) is differed significantly over rest of the other treatments. The lowest AGR values also lower in control at this stage (0.133).

Crop growth rate (g m^{-2} day^{-1})

The crop growth rate (CGR) showed significant differences among the nutrition treatments (Table 2), at all the stages. CGR was more during 40-60 DAS (8.95) as compared to 60-80 DAS (5.83).

Net assimilation rate (g dm^{-2} day^{-1})

The data pertaining to net assimilation rate (NAR) showed significant differences among the nutrients at all the stages (Table 3). The data indicated that NAR was more during 40-60 DAS compared to 60-80 DAS.

Application of $MnSO_4$ (0.3%) recorded significantly higher NAR (0.529) which was on par with KNO_3 (0.5%) + $FeSO_4$ (0.3%) (0.527) and significantly lower NAR value was noticed in control at 40-60 DAS. Whereas, $MnSO_4$ (0.3%) treatment showed significantly higher NAR (0.367) over other treatments.

Fungicides are effective in controlling these two diseases but due to environmental and human health concern, their use is not preferred. Breeding resistant line in pulses is limited because of multiple gene involvement. Hence, the present investigation was carried out to find out the effect of nutrients spray on physiology, yield improvement by minimizing the disease incidence of powdery mildew and cercospora leaf spot in blackgram because these two diseases are major problem for farmers of northern Karnataka. The disease severity is much more at Dharwad during *Kharif*season, The experimental results are discussed in this chapter.

Among the nutrients, $MnSO_4$ (0.3%) had significantly higher CGR value over all other treatments. Unsprayed control recorded significantly lower CGR values compared to other treatments. Similar trend was also noticed during 60-80 DAS.

The nutritional studies in host plant determine the resistance or susceptibility to the diseases and cause histological and morphological changes or properties and functions of tissues to hasten or slow pathogenesis and the virulence ability of pathogens to survive. Non-availability of nutrient elements needed to synthesize chemical and physical barriers, or the diversion of elements in to metabolic cul-de-sacs around infection sites, can result in susceptibility to disease (Huber, 1981).

Growth parameters help to understand the pattern of crop growth and development as affected by the cercospora leaf spot and powdery mildew (Mehi, *et al.* 2014). The absolute growth rate (AGR), crop growth rate (CGR) and net assimilation rate (NAR) are the important growth parameters influencing yield potential which are the dependent on genotype and environment. Because of higher rate of dry matter production at later stages the AGR and CGR were higher during 40 to 60 DAS. Similar results were also reported by Reddy and Saxena (1983).

In present investigation, all the growth parameters differed significantly at both stages and the parameters were significantly higher in treatment with $MnSO_4$, and its combinations, $FeSO_4$ combinations and $MgSO_4$ compared to control. Lower values of AGR, CGR and NAR were recorded in control plot and was attributed to defoliation of leaves and lower dry matter production due to disease incidence and early spread of disease to the tune of 90.45 per cent PDI at 75 DAS. Franje (1977) also reported that in soybean plants with lesser rust incidence recorded higher values for NAR and CGR. Similarly, Selium (1992) reported that CGR, NAR and AGR were higher with spraying of $MnSO_4$ or $FeSO_4$ combinations in soybean (Murade*et al*. 2014).

Table.1. Effect of nutrients on crop growth rate (g m^{-2} day^{-1}) in blackgram

Treatments	Crop growth rate (g m^{-2} day^{-1})	
	40 to 60 DAS	60 to 80 DAS
T_1 - Foliar application of KNO_3 (0.5%)	7.49	5.41
T_2 - Foliar application of $MnSO_4$ (0.3%)	10.81	6.39
T_3 - Foliar application of $ZnSO_4$ (0.3%)	7.65	5.44
T_4 - Foliar application of $MgSO_4$ (0.5%)	10.73	6.38
T_5 - Foliar application of H_3BO_3 (0.2%)	8.18	5.75
T_6 - Foliar application of $CuSO_4$ (0.2%)	8.17	5.62
T_7 - Foliar application of $FeSO_4$ (0.3%)	9.86	6.37
T_8 - Foliar application of $MnSO_4$ (0.3%) + $CuSO_4$ (0.2%)	10.69	6.32
T_9 - Foliar application of $ZnSO_4$ (0.3%) + $FeSO_4$ (0.3%)	18.40	5.79
T_{10} - Foliar application of H_3BO_3 (0.2%) + $CuSO_4$ (0.2%)	9.37	6.29
T_{11} - Foliar application of KnO_3 (0.5%) + $FeSO_4$ (0.3%)	9.53	6.31
T_{12} - Control	6.53	3.93
Mean	**8.95**	**5.83**
S.Em$\pm$	0.22	0.33
CD at 5%	0.66	0.97

Table.2. Effect of nutrients on absolute growth rate (g $plant^{-1}$ day^{-1}) in blackgram

Treatments	Absolute growth rate (g $plant^{-1}$ day^{-1})	
	40-60 DAS	60 -80 DAS
T_1 - Foliar application of KNO_3 (0.5%)	0.123	0.147
T_2 - Foliar application of $MnSO_4$ (0.3%)	0.201	0.289
T_3 - Foliar application of $ZnSO_4$ (0.3%)	0.135	0.182
T_4 - Foliar application of $MgSO_4$ (0.5%)	0.163	0.197
T_5 - Foliar application of H_3BO_3 (0.2%)	0.162	0.192
T_6 - Foliar application of $CuSO_4$ (0.2%)	0.148	0.189
T_7 - Foliar application of $FeSO_4$ (0.3%)	0.192	0.207
T_8 - Foliar application of $MnSO_4$ (0.3%) + $CuSO_4$ (0.2%)	0.196	0.237
T_9 - Foliar application of $ZnSO_4$ (0.3%) + $FeSO_4$ (0.3%)	0.189	0.266
T_{10} - Foliar application of H_3BO_3 (0.2%) + $CuSO_4$ (0.2%)	0.173	0.216
T_{11} - Foliar application of KnO_3 (0.5%) + $FeSO_4$ (0.3%)	0.176	0.229
T_{12} - Control	0.118	0.133
Mean	**0.165**	**0.207**
S.Em$\pm$	0.02	0.02
CD at 5%	0.05	0.05

Table.3. Effect of nutrients on net assimilation rate(g dm^{-2} day^{-1}) at different growth stages in blackgram

Treatments	Net assimilation rate (g dm^{-2} day^{-1})	
	40 to 60 DAS	60 to 80 DAS
T_1 - Foliar application of KNO_3 (0.5%)	0.408	0.271
T_2 - Foliar application of $MnSO_4$ (0.3%)	0.529	0.367

T_3 - Foliar application of $ZnSO_4$ (0.3%)	0.407	0.305
T_4 - Foliar application of $MgSO_4$ (0.5%)	0.501	0.326
T_5 - Foliar application of H_3BO_3 (0.2%)	0.474	0.290
T_6 - Foliar application of $CuSO_4$ (0.2%)	0.437	0.283
T_7 - Foliar application of $FeSO_4$ (0.3%)	0.502	0.317
T_8 - Foliar application of $MnSO_4$ (0.3%) + $CuSO_4$ (0.2%)	0.511	0.336
T_9 - Foliar application of $ZnSO_4$ (0.3%) + $FeSO_4$ (0.3%)	0.522	0.351
T_{10} - Foliar application of H_3BO_3 (0.2%) + $CuSO_4$ (0.2%)	0.492	0.337
T_{11} - Foliar application of KnO_3 (0.5%) + $FeSO_4$ (0.3%)	0.527	0.349
T_{12} - Control	0.402	0.260
Mean	**0.469**	**0.313**
S Em+	0.02	0.02
Cd at 5%	0.05	0.06

BIBLIOGRAPHY

[1] Anonymous, 2000, The Hindu Survey of Indian Agriculture, pp. 40-45.
[2] Birbal,B. andSingh, P. S., 2015.Evaluation of certain insecticides against spotted pod borer [marucavitrata(geyer)] on mungbean (vignaradiatal.).The Bioscan., 10(3): 1037- 1039.
[3] Franje, N. S., 1977, The effect of rust on the photosynthetic activity of soybean (Glycine max (L.) Merrill). M. Sc. (Agri.)Thesis, University of Philippines, Los Banos.
[4] Huber, D. M., 1981, The role of mineral nutrition in defence. In :Plant Diseases an advance treatise. Ed. Horsfall, J. G. and Cowling, E. B.). Academic Press, Inc., New York, **5** : 381-400.
[5] Mehi, L., Mohd, A., Santosh, K., Vivek, S. and Anis, K., 2014.Effect of media, nitrogen sourcesand temperature on the growth and sporulation of curvularialunata causing curvularia leaf spot of blackgram.The Bioscan., 9(3): 1197-1199.
[6] Murade, B.,Patil, D. B. Jagtap, H. D. and More, S. M. 2014.Effect of spacing and fertilizer levels on growth and yield of urdbean.The Bioscan., 9(4): 1545-1547.
[7] Radford, P. I., 1967, Growth analysis formulae, their use and abuse. Crop Sci., **7** :171-178.
[8] Reddy, A. S. and Saxena, M. C., 1983, Studies on growth analysis of soybean. The Andhra Agric. J., **30** : 213-215.
[9] Selim, M. M., 1992, Effect of sowing methods and foliar nutrition with urea and some micronutrients on growth and yield of soybean (Glycine max (L.) Merrill).
[10] Watson, D. J., 1952, The physiological basis of variation in yield. Adv. Agron., **4** :101-145.