



Effect of foliar application of chelated nutrient on the growth, yield attributes and yield of irrigated green gram

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Abstract

Field experiment was conducted at the Experimental Farm, Department of Agronomy, Faculty of Agriculture, Annamalai University, Annamalai Nagar to study the effect of foliar application of chelated nutrient on the growth, yield attributes and yield of irrigated greengram. Fourteen treatments combinations were studied in RBD with three replication. The yield attributes of greengram viz., number of pods plant⁻¹, number of grains pod⁻¹, grain yield and haulm yield were favorably influenced by foliar application of 0.2% chelated nutrient + 2% DAP at flowering and pod formation stages (T₁₁). The control (T₁) recorded the lowest values of yield and yield attributes. Based on the results of field experiment, it is concluded that the foliar application of 0.2% chelated nutrient +2% DAP at flowering and pod formation stages is efficient nutrient management practice for maximizing the growth, yield attributes and yield of irrigated greengram.

Keywords: foliar application, chelated nutrient, DAP growth characters, yield attributes and yield of greengram

Introduction

Pulses are important food crop in India. Pulses can be used as food and animal feed. They are important for sustainable agriculture as they improve physical, chemical and biological properties of soil and function as mini nitrogen factory. Many exporting countries are dependent on India for marketing their pulses. Even though India is the world's largest producer, importer and consumer of pulses, still there is a gap of 2.4 million tonnes between the production and consumption of pulses in the country which is met through import.

The low yield is attributed to several reasons viz., its cultivation as rainfed crop, intercrops in marginal lands, poor management practices and low yield potential of varieties. In addition to that the lack of sufficient nutrients supply during the critical stages of crop growth leads to nutrient stress, and then poor productivity of the crop even under irrigated conditions. Proper nutrient management is an important factor to be considered for sustaining pulse productivity (Malik *et al.*, 2006) [6]. The combined application of RDF + foliar spray of DAP @ 1% + urea @ 1% + chelated B @ 0.2% at flowering after sowing significantly increased the grain yield of kharif greengram (Muthal *et al.*, 2016) [9]. The available literature proves the possible effect of foliar spray in pulses especially in greengram to increase the productivity. But very limited work had been carried out in these lines to develop region specific recommendation to maximizing the yield of greengram. Hence, the present field study was carried out the effect of foliar application of chelated nutrient on the growth, yield attributes and yield of irrigated greengram.

Materials and method

The field experiment was conducted to study the effect of foliar application of chelated nutrient on the growth characters

of irrigated greengram at Annamalai University Experimental Farm, Annamalai Nager. There were altogether fourteen treatments combinations like T₁ -water spray only (control), T₂ - 2% DAP spray twice (flowering and pod formation stages), T₃ - 0.2% chelated nutrient spray at flowering stage, T₄ - 0.2 chelated nutrient spray at pod formation stage, T₅ - 0.2% chelated nutrient spray twice at flowering and pod formation stages, T₆ - 0.4% chelated nutrient spray at flowering stage, T₇ - 0.4% chelated nutrient spray at pod formation stage, T₈ - 0.4% chelated nutrient spray twice at flowering and pod formation stages, T₉ - 0.2% chelated nutrient +2% DAP spray at flowering stage, T₁₀ - 0.2% chelated nutrient + 2 % DAP spray at pod formation stage, T₁₁- 0.2% chelated nutrient + 2% DAP spray at flowering and pod formation stages, T₁₂- 0.4% chelated nutrient + 2%DAP spray at flowering stage, T₁₃ - 0.4% chelated nutrient + 2% DAP spray at pod formation stage and T₁₄- 0.4% chelated nutrient +2%DAP spray at flowering and pod formation stages. The experiment was laid out in RBD with three replications. The greengram variety chosen for the experimental was VBN 3. Seeds were dibbled adapting a spacing of 30×10 cm (30 cm between the rows and 10 cm between plants in a row. Two seeds were dibbled at a depth of 1 to 2 cm and then covered with the soil. Irrigation was given immediately after sowing. Life irrigation was given on third day after sowing (DAS) and subsequent irrigations depending on the weather conditions.

Results and discussion

The plant height and dry matter production (Table 1) was significantly influenced by foliar application of 0.2% chelated nutrient +2% DAP at flowering and pod formation stages (T₁₁). This treatment recorded the highest plant height (53.46

cm) and dry matter production (3127 kg ha⁻¹) during the experiment at harvest stage, respectively. This was followed by foliar application of 0.2% chelated nutrient spray at flowering and pod formation stages (T₅). The least plant height of (41.31cm) and dry matter production (2030 kg ha⁻¹) during the experiment at harvest stage, respectively were recorded under control (T₁). Foliar application of chelated nutrient and DAP enhanced the availability of macro and micro nutrients throughout the crop growth period which might have helped in increasing translocation into the plants without any loss that contributed for better photosynthetic activity and ultimately reflected on significant increase in plant height reported by Manivannan *et al.* (2002) [7] and Pradeep Mohan Dixit and Elamathi (2007) [12]. Readily availability of macro and micro nutrient from foliar fertilization of chelated nutrient and DAP till the completion of crop growth that would enhanced better biomass production. Similar finding of Mondal *et al.* (2011) [8] and (Muthal *et al.*, 2016) [9].

The highest leaf area index and number of effective nodules plant⁻¹ (Table 1) was recorded with the foliar application of 0.2% chelated nutrient + 2% DAP at flowering and pod formation stages (T₁₁) which recorded (3.25) leaf area index and (17.71) nodules plant⁻¹ at flowering stage. This was followed by application of 0.2% chelated nutrient spray at flowering stage and pod formation stage (T₅). The least leaf area index of 1.02 and number of effective nodules of 14.23 plant⁻¹ was recorded by control (T₁). Effective nutrient management in greengram ecosystem by rational application of chelated micro nutrient and macro nutrients might have caused internal root growth, which occurred primarily from the lower hypocotyls and resulted in increased total length of lateral root and ultimately enhanced the rhizobial activity in legumes. Similar finding was reported by Jack *et al.* (2000) [2] and Suriyalakshmi (2013) [14].

The number of pods plant⁻¹, pod length (Table 2) was significantly influenced by foliar application of 0.2% chelated nutrient +2% DAP at flowering and pod formation stages

(T₁₁). This treatment recorded the highest pod number of 17.00 plant⁻¹, pod length of 8.24 cm and grain number of 7 pod⁻¹ during the experiment at harvest stage, respectively. This was followed by foliar application of 0.2% chelated nutrient spray at flowering and pod formation stages (T₅). The least number of pods (13.60) plant⁻¹, pod length 5.47 cm and grains pod⁻¹ (4.38) during the experiment at harvest stage, respectively were recorded under control (T₁).

The highest grain yield and haulm yield (Table 2) was recorded with the foliar application of 0.2% chelated nutrient + 2% DAP at flowering and pod formation stages (T₁₁) which recorded the highest grain yield of 1050 kg ha⁻¹ and haulm yield of 2554 kg ha⁻¹ at harvest stage. This was followed by application of 0.2% chelated nutrient spray at flowering stage and pod formation stage (T₅). The least grain yield of 431 kg ha⁻¹ and haulm yield of 2090 kg ha⁻¹ was recorded by control (T₁). Foliar application of chelated nutrient and DAP increased leaf area, chlorophyll content, total dry matter, flower number, reproductive efficiency and efficient assimilate translocation to the developing sink might be the reason for higher number of pod plant⁻¹ as reported by Nigamananda Behera and Elamathi (2007) [12], Mondal *et al.*, (2011) [8] and Godase *et al.* (2014) [1]. The number of grains pod⁻¹ was significantly influenced by foliar application of 0.2% chelated nutrient + 2% DAP at flowering and pod formation stages (T₁₁). Higher LAI up to the final stage of crop and leaves became active which would have helped to increase the photosynthetic machinery, photosynthetic pigments and photosynthetic rate might have contributed for greater assimilate supply to the pods resulting in higher number of grains pod⁻¹ in the above treatment combination. The results are in agreement with the findings of Kalaimani (2014) [4]. Mannivanan *et al.* (2002) stated that micronutrients play an important role in increasing grain yield and haulm yield of the crop through their effect on the plant itself and on the nitrogen fixing symbiotic process, enhance the chlorophyll content, increase the photosynthetic rate, translocation of photosynthates and catalyst for various enzyme system.

Table 1: Effect of foliar nutrients on growth characters of greengram

| Treatments | Plant height at harvest | Leaf area index at (FS) | Dry matter production (kg ha ⁻¹) at harvest | Number of effective nodules plant ⁻¹ at (FS) |
|--|-------------------------|-------------------------|---|---|
| T ₁ - Water spray only (control) | 41.31 | 1.02 | 2030 | 14.23 |
| T ₂ - 2% DAP at flowering (FS) and pod formation (PF) stages | 42.49 | 1.41 | 2156 | 14.63 |
| T ₃ - 0.2% chelated nutrient spray at FS stage | 48.87 | 2.47 | 2657 | 16.58 |
| T ₄ - 0.2% chelated nutrient spray PF stage | 47.77 | 2.36 | 2641 | 16.44 |
| T ₅ - 0.2% chelated nutrient spray at FS and PF stages | 52.29 | 3.04 | 3001 | 17.35 |
| T ₆ - 0.4% chelated nutrient spray at FS stage | 44.67 | 1.80 | 2312 | 15.16 |
| T ₇ - 0.4% chelated nutrient spray at PF stage | 43.71 | 1.76 | 2284 | 15.06 |
| T ₈ - 0.4% chelated nutrient spray at FS and PF stages | 44.69 | 1.88 | 2353 | 15.35 |
| T ₉ - 0.2% chelated nutrient +2% DAP spray at FS stage | 51.09 | 2.81 | 2877 | 16.96 |
| T ₁₀ - 0.2% chelated nutrient +2% DAP spray at FS and PF stages | 50.06 | 2.78 | 2782 | 16.93 |
| T ₁₁ - 0.2% chelated nutrient +2% DAP spray at FS and PF stages | 53.46 | 3.25 | 3127 | 17.71 |
| T ₁₂ - 0.4% chelated nutrient +2% DAP spray at FS stage | 46.48 | 2.12 | 2485 | 15.78 |
| T ₁₃ - 0.4% chelated nutrient +2% DAP spray at PF stage | 45.93 | 2.06 | 2478 | 15.72 |
| T ₁₄ - 0.4% chelated nutrient +2% DAP spray at FS and PF stages | 46.61 | 2.13 | 2515 | 16.03 |
| S.E _D | 0.45 | 0.07 | 49.10 | 0.13 |
| CD (p=0.05) | 1.14 | 0.17 | 123.25 | 0.34 |

Table 2: Effect of foliar nutrients on yield attributes and yield of greengram

| Treatments | Yield attributes | | Yield (kg ha ⁻¹) | |
|--|------------------------------------|------------------------------------|------------------------------|-------|
| | Number of pods plant ⁻¹ | Number of grains pod ⁻¹ | Seed | Haulm |
| T ₁ - Water spray only (control) | 13.60 | 4.38 | 431 | 2090 |
| T ₂ - 2% DAP at flowering (FS) and pod formation (PF) stages | 14.02 | 4.69 | 504 | 2141 |
| T ₃ - 0.2% chelated nutrient spray at FS stage | 15.88 | 6.13 | 844 | 2377 |
| T ₄ - 0.2% chelated nutrient spray PF stage | 15.73 | 6.02 | 817 | 2370 |
| T ₅ - 0.2% chelated nutrient spray at FS and PF stages | 16.66 | 6.72 | 989 | 2501 |
| T ₆ - 0.4% chelated nutrient spray at FS stage | 14.52 | 5.07 | 583 | 2194 |
| T ₇ - 0.4% chelated nutrient spray at PF stage | 14.41 | 5.01 | 579 | 2192 |
| T ₈ - 0.4% chelated nutrient spray at FS and PF stages | 14.72 | 5.24 | 635 | 2227 |
| T ₉ - 0.2% chelated nutrient +2% DAP spray at FS stage | 16.30 | 6.43 | 918 | 2447 |
| T ₁₀ - 0.2% chelated nutrient +2%DAP spray at FS and PF stages | 17.23 | 6.40 | 907 | 2431 |
| T ₁₁ - 0.2% chelated nutrient +2% DAP spray at FS and PF stages | 17.00 | 7.00 | 1050 | 2554 |
| T ₁₂ - 0.4% chelated nutrient +2%DAP spray at FS stage | 15.12 | 5.56 | 710 | 2293 |
| T ₁₃ - 0.4% chelated nutrient +2%DAP spray at PF stage | 15.09 | 5.54 | 701 | 2283 |
| T ₁₄ - 0.4% chelated nutrient +2%DAP spray at FS and PF stages | 15.35 | 5.76 | 757 | 2317 |
| S.E _D | 0.12 | 0.10 | 23.05 | 16.88 |
| CD (p=0.05) | 0.32 | 0.27 | 57.86 | 42.38 |

Conclusion

Based on the results of present investigation it is concluded that foliar application of 0.2% chelated nutrient + 2% DAP at flowering and pod formation stages significantly enhances the growth characters, yield attributes and yield of greengram.

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