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GROWTH AND YIELD OF SUPER EARLY VARIETIES OF REDGRAM [*Cajanus cajan* (L.) Millsp] UNDER DIFFERENT NUTRIENT LEVELS

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ABSTRACT

A field experiment was conducted at S.V. Agricultural College Farm, Tirupati, Acharya N.G. Ranga Agricultural University, Andhra Pradesh, India during *kharif*, 2021-22 to study the growth attributes and yield performance of super early varieties of redgram under graded levels of nutrients. The field experiment was conducted in a split pot design with three replications. The treatments consist of five varieties *viz.*, ICPL 11301, ICPL 20325, ICPL 20338, ICPL 11255 and ICPL 88039 main plots and three nutrient levels viz., 100, 125 and 150% RDF in sub plots Super early variety of redgram *i.e.*, ICPL 88039 recorded significantly higher plant height, leaf area index and dry matter production, whereas, ICPL 11301 registered higher seed yield among the varieties tested. The highest nutrient dose of 150% RDF resulted in higher growth parameters and seed yield. However, the above parameters were at par with application of 125% RDF (25 kg N, 62.5 kg P_2O_5 and 50 kg k_2O).

KEYWORDS: Redgram, super early varieties, nutrient levels and seed yield

INTRODUCTION

Redgram is traditionally grown as an annual pulse crop in Asia, Africa, the Caribbean islands and Latin America. It is a good source of protein up to 22 percent, vitamins *viz.,* thiamine, riboflavin, niacin and choline and minerals *such as* iron, iodine, calcium, phosphorus, sulphur and potassium. In addition to its primary use as a dhal, its immature green seeds and pods are consumed as vegetable (Yadav *et al*., 2021). India ranks first in redgram production globally 3.88 million tonnes cultivated in an area of 4.82 million hectares with a productivity of 804 kg ha^{-1} (Anonymous, 2020).

Under a changing climate scenario, new short duration super early genotypes of redgram help in achieving a higher harvest index. With the introduction of super early redgram varieties maturing within 90-100 days opens the possibility to explore redgram cultivation during the off- season and non-traditional niches, aiming for an increase the national production pool of pulses. Super early varieties also demonstrated photo insensitivity, maturity synchrony, hardiness and adaptability to multiple cropping systems (Saxena *et al.,* 2019 and Naseeruddin *et al*., 2018). The low yield of redgram is not only due to its cultivation on marginal and sub marginal lands, but also due to poor crop management. For proper maintenance of the health of crops and to obtain a high yield, balanced fertilization is necessary throughout the crop period. Nitrogen, phosphorous and potassium are three major nutrients required for the crop production and should be used in proper proportion. Nitrogen and potassium when applied together have a synergistic effect on the crop. Only in the presence of an adequate amount of potassium the best response of nitrogen can be obtained (Sekhon *et al*., 2018). There is a need for identify suitable super early genotype of redgram and optimum dose of nutrients to increase the productivity and profitability of redgram.

MATERIAL AND METHODS

The present investigation was carried out at wetland farm, S.V. Agricultural College, Tirupati of Acharya N.G. Ranga Agricultural University which is geographically situated at 13.5°N latitude and 79.5°E longitude with an altitude of 182.9 m above mean sea level in the Southern Agro-Climatic Zone of Andhra Pradesh. The present experiment was laid out in a split-plot design and replicated thrice. The treatments include five varieties *viz.,* ICPL 11301 (V1), ICPL 20325 (V2), ICPL 20338 (V3), ICPL 11255 (V4) and ICPL 88039 (V5) as main plots and three nutrient levels *viz.,* 100% RDF (N1), 125% RDF (N2) and 150% RDF (N3) as sub plots. The fertilizer was applied as basal using 100% RDF (20:50:40 kg N, P_2O_5 and K_2O ha^{-1}). The crop was sown at a spacing of 45 cm

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× 15 cm. The experimental field was sandy loam in texture which is low organic carbon (0.42%). The soil is neutral in reaction (pH 7.3), low in available N (162 kg ha^{-1}) and potassium (141 kg ha^{-1}) and medium in available phosphorus (36 kg ha^{-1}). A total rainfall of 1277.8 mm was received in 56 rainy days during the crop growing period. The nutrients were applied in the form of urea, single super phosphate and muriate of potash. All the other recommended practices were adopted as per the recommendations. The data collected on plant height, leaf area index, dry matter production and seed yield was analyzed statistically following the procedure for split plot given by Panse and Sukhatme (1978).

RESULTS AND DISCUSSION

Plant height

The highest plant height was noticed with ICPL 88039, which was significantly superior over other genotypes tried. ICPL 20325 and ICPL 11301 were the next best varieties in recording higher plant height with no significant disparity between them (Table 1). This was followed by ICPL 20338 which was however comparable with ICPL 11255, which recorded the lowest plant height. The increase in plant height among the varieties might be due to the variation in their genetic makeup, internodal length, nutrient absorption capacity and conversion of radiant energy in presence of chlorophyll. The above results are in conformity with the findings of Ranjani *et al*. (2018), Deepika (2020) and Shruthi (2020).

Among the different nutrient levels tried, higher plant height of redgram was noticed with application of 150% RDF, which was however comparable with application of 125% RDF and significantly superior over 100 % RDF, which recorded lower plant height. This might be due to the fact that higher level of nutrient application 150 % RDF resulted in more availability, better uptake and translocation of plant nutrients to plants, which helped in differentiation and expansion of component cells, cell division and cell multiplication thereby producing better plant height. Similar results were also reported by Dalai *et al*. (2019) and Parameshwarareddy *et al*. (2019).

Leaf area index

The highest leaf area index was produced by ICPL 88039, which was significantly higher than rest of the varieties tested. The next best variety in recording higher leaf area index was ICPL 20325, which in turn was comparable to ICPL 11301. The lowest leaf area index was produced by ICPL 11255 which was at par with ICPL 20338 (Table 1). Higher leaf area index was observed with ICPL 88039 due to better growth that was evident from the plant height, varietal differences in leaf area, number of green leaves and delayed senescence of leaves. These results are in agreement with the findings of Ranjani *et al*. (2018) and Shruthi (2020).

Leaf area index of redgram significantly varied due to nutrient levels. Crop fertilized with 150% RDF produced higher leaf area index, which was statistically at par with 125% RDF (Table 2). Significantly lower leaf area index was registered with 100% RDF. Higher leaf area index observed with application of 150% RDF might be due to increased nutrient availability in soil which made the plant to absorb more nutrients, which in turn increased the number of leaves, total leaf area $plant^{-1}$ and their effect on enlargement of cells of the leaf through their cell division and assimilation of photosynthates might have retained more leaf area. Similar findings were also reported by Nagamani (2015) and Parameswarareddy *et al*. (2019).

Drymatter production

The highest dry matter accrual was noticed with ICPL 88039 which was significantly superior to other varieties investigated (Table 1). This could be mainly due to increase in plant height, leaf area index and due to their genetic makeup. Increased assimilatory surface area per plant might have led to increased biomass production, which ultimately led to the accumulation of a large quantity of photo assimilates. This is in accordance with the results reported by Shruthi *et al*. (2020). The next best variety was ICPL 20325 which was however comparable with ICPL 11301. The variety ICPL 11255 (V4) produced the lower dry matter, but was however comparable with ICPL 20338.

With regard to nutrient levels, higher dry matter accumulation was registered with application of 150% RDF which was in parity with application of 125% RDF. The lowest dry matter production was with 100% RDF, which was significantly lower than the other two higher nutrient levels. Higher dry matter production obtained with 150% RDF might be due to increased availability of nutrients over the longer periods, better utilization of available growth resources *viz*., nutrient, moisture and solar radiation to a greater extent. It resulted in favourable

Table 1. Effect of graded levels of nutrients on plant height, leaf area index, dry matter production and seed yield of super early varieties of redgram

Treatments	Plant height (cm)	Leaf area index	Dry matter production (kg ha^{-1})	Seed yield (kg ha^{-1})
Varieties (VI				
V_1 : ICPL 11301	105	2.10	4134	1279
V_2 : ICPL 20325	111	2.22	4490	1176
V_3 : ICPL 20338	77	1.52	3043	974
V_4 : ICPL 11255	75	1.40	2705	971
V5 : ICPL 88039	161	4.86	5332	1075
SEm±	3.2	0.046	123.1	30.1
CD (P = 0.05)	10	0.14	370	91
Nutrient levels (N)				
N_1 : 100 % RDF	99	1.95	3843	1007
N_2 : 125 % RDF	106	2.56	4498	1118
N_3 : 150 % RDF	110	2.62	4682	1160
SEm±	2.6	0.044	90.3	20.3
CD (P = 0.05)	6	0.12	270	60
Varieties (V) × Nutrient levels (N)				
N at V				
SEm±	5.4	0.076	193.4	47.7
CD (P = 0.05)	NS	NS	NS	NS
V at N				
SEm±	5.1	0.091	199.9	66.5
CD (P = 0.05)	NS	NS	NS	NS

effect on cell enlargement and production of larger leaves. This might have eventually reflected in higher photosynthetic efficiency and thereby accumulated higher quantity of dry matter. Enhanced dry matter production with adequate supply of nutrients as evidenced in this investigation, corroborates with the findings of Dalai *et al*. (2019) and Preetham *et al*. (2020).

Seed yield

Significantly higher seed yield was produced by the variety ICPL 11301 (Table 1). ICPL 20325 and ICPL 88039 were the next best varieties in recording higher seed yield, with significant disparity between them. Whereas, the lower seed yield was recorded with ICPL 11255, which was comparable with ICPL 20338. Difference in yields among the varieties can be attributed

to their genetic potentiality to utilize and translocate photosynthates from source to sink. ICPL 11301 was found to be the best redgram variety with a seed yield of 1279 kg ha^{-1} due to efficient translocation of photosynthates from source to sink. However, ICPL 88039 recorded higher growth parameters during crop growth period but produced lower yield than ICPL 11301 due to poor translocation of photosynthates from vegetative parts to pods during pod development stage and maturity. Similar results of higher seed yield with different genotypes were reported by Srivastava *et al*. (2012) and Ranjani *et al*. (2018).

As regards the nutrient levels, the seed yield increased progressively from 100% RDF to 150% RDF. The highest seed yield was recorded with higher nutrient level of 150% RDF, which was at par with 125% RDF. The lowest seed yield was recorded with the lowest nutrient level of 100% RDF, which was significantly lesser than rest of the nutrient levels tried.

On the basis of above investigation, it can be inferred that ICPL 88039 was superior with respect to growth attributes and ICPL 11301 registered significantly higher seed yield compared other varieties tried. With respect to nutrient doses, application of 150% RDF resulted in higher growth attributes and seed yield which was however comparable with 125% RDF. It could be inferred that super early redgram variety, ICPL 11301 in combination with application of 125% RDF (25 kg N, 62.5 kg P_2O_5 and 60 kg K_2O) is the best option for obtaining higher growth parameters and seed yield on sandy loam soils of Sourhern Agro-Climatic Zone of Andhra Pradesh.

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