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EFFECT OF SEED HARDENING AND FOLIAR NUTRITION ON GROWTH ATTRIBUTES AND YIELD OF GREENGRAM UNDER RAINFED CONDITION

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Abstract

Field experiment was conducted at farmer's field of A. Mallapuram Village, Palacode Taluk, Dharmapuri District, Tamil Nadu during July to October, 2018 to study the influence of seed hardening and foliar nutrition in greengram under rainfed conditions. The experiment was laid out in Randomized Block Design (RBD) with nine treatments and three replications, by using the greengram variety Paiyur-1. Among the different treatments the treatment (T_7) seed hardening with 1% KH_2PO_4 + DAP foliar spray @ 2%, recorded significantly the highest growth attributes and yield such as germination percentage, shoot length, root length, vigour index, plant height, LAI, DMP and seed yield. This was followed by seed hardening with 1% KH_2PO_4 + GA_3 foliar spray @ 0.2% (T_5). The least seed yield of 429 kg ha^{-1} was observed under control (T_1).

Key words : Greengram, Seed hardening, KH_2PO_4.

Introduction

Greengram also known as mung, moong, mungo, golden green, oregon pea is a self pollinated leguminous crop which is grown in arid and semi arid regions of India. It is the fourth important pulse crop after chick pea, pigeon pea and black gram cultivated throughout India. It has an excellent source of protein (24.5%) with high quality of lysine (460 mg/g N) and tryptophan (60 mg/g N) with low contents of anti nutritional factors. It also contains remarkable quantity of ascorbic acid and riboflavin (0.21 mg /100 g) (Azadi *et al.,* 2013). In India, green gram represents total pulse area of 40.70 lakh ha and 19.01 lakh tonnes of pulse production with the average yield of 426 kg ha^{-1} (GOI, 2017-18). In Tamil Nadu, green gram is cultivated in 1.85 lakh ha with a production of 0.95 lakh tonnes (GOI, 2017-18). The current level of production is well below the requirement and future projected demand for 2022 also mounting 16.1 million tonnes, to meet the specified per capita requirement. The productivity of greengram is low due to various constraints in rainfed situations such as biotic and abiotic factors. Also, the low yield is attributed by several reasons like inadequacy of soil moisture during early stages, poor nutrient availability and management practices and low yield potential of varieties. In addition to that the lack of nutrients during the critical stages of crop growth leads to nutrient stress, which leads to poor yield and productivity of the crop (Ramesh *et al*., 2016). Many studies have been conducted on moisture requirement and time of sowing in greengram. Studies on drought mitigation needs to given important achieve sustainable yields in greengram. With this background, the present investigation was undertaken to find out suitable methods seed hardening and foliar nutrition on improvement of yield in greengram.

Materials and Methods

Field experiment was conducted at a farmer's field of A. Mallapuram Village, Palacode Taluk, Dharmapuri District, Tamil Nadu during July to October, 2018 to study the influence of seed hardening and foliar nutrition in greengram under rainfed condition. The experimental field is geographically situated at 12º 35' N latitude and 78º 01' E longitude at an altitude of + 478 meters above mean sea level. The farm is characterized by tropical climate with warm and hot summer months. The soil of the experimental field was sandy clay loamy in texture with low in available nitrogen, medium in available phosphorus and potassium.The green gram variety Paiyur-1 was chosen for the study. The field experiments were conducted in randomized block design with 3 replications. The treatments comprised of T_1 – Control, T_2 - seed hardening with 1% KCL, T_3 - seed hardening with 1% KH_2PO_4, T_4 - seed hardening with 1% KCL + GA_3 foliar spray @ 0.2%, T_5 - seed hardening with 1% KH_2PO_4 + GA_3 foliar spray @ 0.2%, T_6 - seed hardening with 1% KCL + DAP foliar spray @ 2%, T_7 - seed hardening with 1% KH_2PO_4 + DAP foliar spray @ 2%, T_8 - seed hardening with 1% KCL + Triacontonal foliar spray @ 0.5% and T_9 - seed hardening with 1% KH_2PO_4 + Triacontonal foliar spray @ 0.5%. The salient finding of field experiment are presented below. Observations on growth and yield attributes were taken on five randomly selected peg marked plants in periodical intervals. The mean values were used for statistical analysis as suggested by Panse and Sukatame (1978).

Results and Discussion

Growth attributes

All the growth components were significantly influenced by various seed hardening treatments and foliar spraying of nutrients. The growth components *viz.,* germination percentage, shoot length, vigour index, plant height, number of branches plant^{-1}, leaf area index, dry matter production and number of effective root nodules plant^{-1} were significantly influenced by seed hardening methods and foliar spray of nutrients on greengram table. Among the different treatments, seed hardening with 1% KH_2PO_4 + foliar application of DAP 2% @ 25 and 45 DAS (T_7) registered the highest germination percentage, shootlength and vigour index on greengram. This might be due to uniform and early emergence of seedlings in field enable the crop to best utilize the available resources under stressful conditions. The results were in agreement with the findings of Arshad Aslam *et al.,* (2013), and Pradeep Kumar Sharma *et al*., (2017). The increase in shoot length also due to its stimulation effect in the formation of enzymes which are important in the early phase of germination which helps for a fast radical protrusion and shoot growth in the crops (Golezani *et al*., 2011).

Among the different treatments, seed hardening with 1% KH_2PO_4 + foliar application of DAP 2% @ 25 and 45 DAS (T_7) significantly recorded the maximum growth attributes like plant height 56.74 cm, LAI of 3.00 at flowering stage and DMP of 3710 kg ha^{-1} at harvest stage of the crop table. This might be due to seed hardening and foliar application of DAP which 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. The significant increase of dry weight plant^{-1} was due to the fact that nitrogen in DAP, helps in maintaining higher auxin level which might have resulted in better plant height, leaf area of the leaves. This might have resulted into better interception, absorption and utilization of radian energy, leading to higher photosynthetic rate and finally more accumulation of dry matter by the plants (Deepak

Table 1: Effect of seed hardening and foliar nutrition on growth attributes and yield of rainfed greengram.

Treatments		Germination percentage	Root Length (cm)	Shoot Length (cm)	Vigour index	Plant height (cm)	LAI at flowering	DMP (kgha^{-1})	Yield (kgha^{-1})
T_1	Control	85(67.21)	5.70	7.01	1080.35	35.27	1.38	1960	429
T_2	Seed hardening with 1% KCL	91(72.54)	5.98	7.79	1253.07	37.88	1.53	2239	461
T_3	Seed hardening with 1% KH_2PO_4	95.49(77.73)	7.04	8.98	1529.74	40.53	1.71	2440	494
T_4	Seed hardening with 1% KCL + GA_3 foliar spray @ 0.2%	89.90(71.46)	6.30	7.87	1273.88	46.00	2.10	2871	567
T_5	Seed hardening with 1% KH_2PO_4 + GA_3 foliar spray @ 0.2%	95.19(77.33)	7.00	8.95	1518.28	54.13	2.66	3505	669
T_6	Seed hardening with 1% KCL + DAP foliar spray @ 2%	89.80(71.37)	6.37	7.92	1283.24	48.61	2.31	3094	599
T_7	Seed hardening with 1% KH_2PO_4 + DAP foliar spray @ 2%	95.29(77.46)	6.94	8.95	1514.15	56.74	3.00	3710	702
T_8	Seed hardening with 1% KCL+ Triacontonal foliar spray @ 0.5%	89.70(71.28)	6.49	8.00	1299.75	43.29	1.88	2680	532
T_9	Seed hardening with 1% KH_2PO_4 + Triacontonal foliar spray @ 0.5%	94.89(76.93)	7.02	8.89	1509.69	51.42	2.47	3315	633
	S.Ed	1.87	0.12	0.16	28.99	0.93	0.07	91.84	14.98
	CD (P=0.05)	3.79	0.27	0.35	60.44	1.97	0.12	187.69	31.22

kumar *et al.,* 2018). Similar finding was reported by Uma Maheswari *et al.,* (2017).

Yield

Among the different treatments, seed hardening with 1% KH_2PO_4 + foliar application of DAP 2% @ 25 and 45 DAS (T_7) recorded significantly higher grain yield (702 kg ha^{-1}) in green gram table. This might be due to adequate supply of nutrients at different growth stages of the crop which helped in better absorption and translocation into the plant system more efficiently contributing to developing pods and proper filling up of seeds thereby resulting in higher grain yield (Thanunathan *et al*., 2018). Also the increased uptake of nutrients by effective translocation of nutrients from source to reproductive part of the crop which also increased LAI and dry matter production results in higher grain and haulm yield respectively. This result was in conformity with the reports of Kalaichelvi *et al*., (2006). The least grain yield was recorded under control (T_1) might be due to lack of adequate supply of phosphorus and nitrogen to the crop which in turn affected the growth and yield components of the crop ultimately reflecting on yield parameters. The present results were in agreement with earlier findings of Shashikumar *et al.* (2013), Marimuthu and Surendran (2015), Muthal *et al.,* (2016) and Ramesh *et al.,* (2016).

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