Effect of different levels of spacing and organic fertilizers on growth and yield of summer moong (Vigna radiata L.)

- A REVIEW

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Abstract

Green gram cultivar GM-4 performed better by recording higher number of branches per plant (3.17), dry matter accumulation per plant at both 30 DAS (7.19 g) and at harvest (14.91 g) and dry weight of root nodules per plant at both 30 DAS (2.25 g) and at harvest (3.41 g), number of pod per plant (26.44), length of pod (6.14 cm) and test weight (38.90 g) when sowing with 45 cm row spacing over 30 cm row spacing but seed yield (930 kg ha-1) and Stover yield (2151 kg ha-1) where recorded with 30 cm row spacing over 45 cm row spacing. Application of 100% RDF recorded higher values for number of branches per plant (2.83), dry matter accumulation per plant at harvest (14.50 g) and dry weight of root nodules per plant at both 30 DAS (2.21 g) and at harvest (3.39 g), length of pod (6.19 cm) and test weight (39.35 g), seed yield (945 kg ha-1) and Stover yield (1900 kg ha-1) over 75 % RDF and control. Inoculation of Rhizobium and PSB also improve growth and yield parameters. generally , for obtaining higher yields green gram variety GM-4 to be grown during summer season with 30 cm row spacing and fertilizing the crop with 100% RDF (20-40-00 kg N-P2O5-K2O ha-1) with inoculation of Rhizobium and PSB.

Introduction

Summer moong (Vigna radiata L.) is an important pulse crop and short duration grain legume with wide adaptability, low input requirement and have the ability to improve soil fertility by fixing atmospheric nitrogen. Summer moong is a native of India and Central Asia (Vavilov, 1926). In India, summer moong is grown about 3.70 million hectares with annual production of 1.57 million tons. India is the largest production of summer moong and account 54 percent of the world production and covers 65% of the world average. In Gujarat, pulse crops grown on 7.0 lac ha out of which summer moong is considered similar to that in commercial fertilizer (Motavalli et al. 1989). Application of manure will produce crop yields

equivalent or superior to those obtained with chemical fertilizers also improve crop quality., improvement response was usually attributed to manure supplied nutrients or to improved soil conditions not provided by commercial fertilizer (CAST 1996). Manure improves the physical condition of the soil and increase P and biological activity. The organic matter, total N and micronutrient content of the surface soil are increased as a result of manure application. The manure requirements for the most of the crops are high, ranging from 5 to 20 tons of fresh manure hactare^{-1}.

Mung bean (Vigna radiata L.) commonly referred to as mung is an ancient and well-known pulse crop that belongs to family Papilionoideae and originated from South East Asia (Mogotsi, 2006). Mung beans are mainly grown for human food, within the sort of boiled dry beans, stew, flour, sprouts and immature pods as a vegetable. The dry beans are sometimes used for animal food, mainly poultry, once they are either roasted or boiled while its biomass is employed as fodder (Winch, 2006). Thus, it's great value as food and fodder. it's an inexpensive source of protein for human consumption.

According to Dainavizadeh and Mehranzadeh (2013), the nutrient composition of the seed of mung contains 20–24% protein, 9.4% moisture, 2.1% oil, 2.05% fats, 6.4% fiber, 343.5 kcal per 100 gram energy, carbohydrates and a good amount of vitamin A and B. additionally , the protein and carbohydrates of mung are more easily digestible than proteins derived from other legumes. On the opposite hand, an equivalent source indicated that mung fixes atmospheric N2 and enriches the soil with N nutrient for the expansion of succeeding crops.

Moreover, the crop are often successfully grown on marginal lands where other crops perform poorly and best suited for manure use (Dainavizadeh & Mehranzadeh, 2013). mung may be a recent introduction to Ethiopia pulse production and it's mostly produced by small-scale farmers of Amhara National Region. Particularly, the crop is grown in some areas of North Shewa, Debere Sina, Qallu and South Wollo also as in some districts of Benishangul Gumuz Regional State (CSA, 2018). The crop is additionally produced in moisture stress areas of the country like Gofa, Konso, South Omo zone and Konta special district (Asrate et al., 2012; Wedajo, 2015).

Mung bean has special features like its earliness in maturity, supply of excellent yield, drought-resilient property that creates it highly responsive in scanty rainfall and its ability to stimulate striga without being parasitized (Georgis, 2010). The crop also has good nutritive value and reasonable cost for the consumers (Asrate et al., 2012; Wedajo, 2015). consistent with CSA (2018) report, the world covered under mung in Ethiopia in 2017/18 cropping was 41,630.20 ha with a productivity of 1,235 kg ha−1. this is often far below the typical productivity reported at the research facility , which is 1,650 kg ha−1 (Asrate et al., 2012). This shows low productivity of the crop at farmer field compared to the research facility . the main reasons for its low productivity are lack of experience of farmers' because it may be a recently introduced crop which isn't known within the area, less attention of farmers to production, limited use of recent inputs and

inappropriate agronomic practices like inadequate or imbalanced fertilizer application, planting spaces and other management practices (Asrate et al., 2012).

Now a days the use of chemical fertilizers is on peak. Due to the need of increasing population, excessive use of chemicals is implemented. But it deteriorates the soil efficiency, fertility and health. An alternative approach is to use the organic nutrients instead of chemical fertilizers.

Organic nutrient management is the best approach to maintain the soil productivity, to reduce the chemical load of the soil and utilize the potential of benefits of all farm resources on soil (organic manures, green manure, plant by- products etc.) Organic nutrient management is ecologically, socially and economically viable. It helps in maintaining the soil micro- organism in the soil provide better environment in the soil.

Application of well-rotten FYM has been reported to improve the soil structure. It increases the soil fertility and adds humus to the soil. It also improves the soil productivity. Poultry manure is act as good soil amendment, as it adds organic matter and increases the water holding capacity of soil and beneficial biota in soil. Pulses are important not just for their value as human food, but also due to high protein content for livestock. it's been important component of Indian agriculture enabling the land to restore fertility by fixing atmospheric nitrogen, so as to produce reasonable yields of succeeding crops and to meet out the demand of dietary requirement regarding proteins, carbohydrates and other nutrient sources. On a mean , pulses contain 22-24 per cent protein as against 8-10 per cent in cereals. an honest amount of lysine is present within the pulses. Pulses vary in maturity periods, hence, are useful in several cropping systems. Greengram locally called as moog or mug (Vigna radiata L. Wilczek) belongs to the family Leguminoceae, which fixes atmospheric nitrogen and improves soil fertility by adding 20-25 kg N ha-1. Being a brief duration crop and having wider adaptability, it are often grown in summer also as in kharif season. It is a crucial ruling crop in summer season, locally known as ‘Vaishakhi Mug’. The yield of summer greengram is relatively quite that of kharif crop, mainly because the controlled moisture conditions through irrigation, abundant sunshine and fewer pest and disease infestation. The greengram foliage left over after picking of mature pods can either be fed to livestock or it may ploughed in place as a manure to complement soil with organic matter. Employment is provided to the farmers and therefore the agricultural labours during off season. Greengram may be a very short duration crop so it are often grown as crop . In India, it occupied a neighborhood of three .24 million hectares having total production of 1.39 million plenty of grain with productivity of 346 kg/ha (Anon., 2015a) . In India, major greengram producing states are Orissa, Madhya Pradesh, Rajasthan, Maharashtra, Gujarat and Bihar. In Gujarat, it's cultivated in about 2.26 lakh hectares with an annual production of 0.97 lakh tones and average productivity of 429 kg/ha (Anon., 2015b) . Greengram crop have direct effect of spacing thanks to availability of moisture and nutrient depend upon spacing.

Review of literature-

Importance of legumes in agriculture needs no further emphasis, as they're valuable items of human nutrition and soil fertility. The available literature on the influence of various spacing and organic fertilizers on growth, yield and quality of summer moong has been reviewed during this chapter. Gandhi et al., (1991) reported that number of pods per plant, seeds per pod, weight of seeds per plant, seed yield and straw yield of cowpea were higher with combined application of 25 kg N and 50 kg P 2 O 5 /ha. Reddy et al., (1991) reported the very best seed yield (10ton/ha) of greengram thanks to application of FYM. Ramamurthy et al., (1995) reported that 5 t FYM/ha and recommended dose of NPK (25 kg N + 50 kg P 2 O 5 + 25 kg K 2 O/ha) to cowpea recorded significantly higher attributes and grain yield than no fertilizer.

Kausale et al., (2009) observed that nodule number, dry matter per plant, pod and haulm yield of groundnut crop increased with application of 100% RDF (25:50 N and P kg/ha), 10 t FYM/ha. More et al., (2008) at Nagpur (Maharashtra), studied the influence of nutrient management treatments on yield attributed and yield of soybean and located that influence of treatment 30:70:00 kg NPK/ha (RDF) was pronounced on the above parameters. Sheoran et al., (2008) conducted a field experiment to review the performance of summer moong genotypes in reference to their nutritional requirement under rainfed conditions. Bhattarai et al., (2003) conducted a field experiment on clayey soil at research farm of the Central Agriculture University, Imphal and observed that application of full recommended nutrient + 5 tonnes per hectare poultry manure recorded the very best plant height and dry matter accumulation per plant in fieldpea. According to Reddy and Reddi (2006), plant density brings out certain modifications within the growth of plants. Plant height increases with the rise in extreme level thanks to competition for highest plant height. Dahmardeh et al., (2010) reported that plant height wasn't suffering from increasing plant density. Moniruzzaman (2011) conducted an experiment on cabbage at the Agricultural Station, Raikhali, Rangamati hill district to seek out out the optimum plant spacing and suitable cabbage variety(s). He found that the broader spacing of 60×45 cm resulted in significantly maximum number if folded leaves and head weight (without unfolded leaves) as compared to closer spacing of 60×30cm. Dordas and Lithourgidis (2011) found that a decrease in yield with higher density of 8 plant m^{-2} , number seeds pod -1 and therefore the number of pods plant -1 , poor concentration and lack of efficient use of space is feeding on the plant. Idris (2008) indicated that increasing plant spacing increased number of pods per plant and consequently gave the very best seed yield. Crops sown in 40cm apart rows produced significantly higher 1000 seeds weight than 60 cm apart double row strips. Significantly effect of row spacing on 1000 seeds weight has also been reported by Ali et al.,(2001).

An important feature of the mung-bean crop is its ability to determine a symbiotic partnership with specific bacteria, setting up the biological N2-fixation in root nodules that provide the plant's needs for N2 (Mahmood and Athar, 2008; Mandal et al., 2009). Mungbean being drought tolerant and short duration can grow well under varied conditions (irrigated and rainfed). Mungbean has the potential of producing higher

seed yield from 1295 to 2961 kg ha-1 counting on the genotypes studied (Ullah et al., 2011; Bilal, 1994). Phosphorus is one of the important plant macronutrients, making up about 0.2% of a plant's dry weight. It is an important component of key molecules such as nucleic acids, phospholipids and ATP, and consequently, plants cannot grow without a reliable supply of this nutrient. P is additionally involved in controlling key enzyme reactions and in the regulation of metabolic pathways (Theodorou and Plaxton, 1993). Phosphorus is present in seed and fruit in large quantities and is important for the seed formation. it's known to stimulate root growth and is related to early maturity of crops. It not only improves the quality of fruits, forages, vegetables and grains but also play role in disease resistance of plants. (Brady and Weil, 1999). Potassium (K) is the third macronutrient required for plant growth, after nitrogen (N) and phosphorus (P). Unlike N and P; K is not a component of cell structure. Instead, it exists in mobile ionic form, and acts primarily as a catalyst (Wallingford, 1980). Potassium has a crucial osmotic role in plants (Tisdale and Beaton 1985) important function in arid environments for plants metabolism. Recently, the utilization of organic materials as fertilizers for crop production has received attention for sustainable crop productivity (Tejada et al., 2009). Organic materials hold great promise as a source of multiple nutrients and skill to improve soil characteristics (Moller, 2009). Organic farming preserves the ecosystem. Symbiotic life forms are cultured ensuring weed and pest control and optimum soil biological activity which maintain soil fertility. The synthetic fertilizers are harmful for soil and aerial environment a threat to entire globe, because the inorganic fertilizers mainly contain major nutrients NPK in large quantities and are neglecting the use of organic manures and bio-fertilizers and hence have paved the way for deterioration of soil health and in turn ill-effects on plants, person and livestock (Choudhry, 2005). Legumes are highly responded to phosphatic fertilizer but high cost and timely availability of this fertilizer is problem. Balance use of fertilizer is important to obtain maximum seed yield. Therefore, the present study was undertaken to estimate the effect of organic and inorganic fertilizers on growth and yield of mungbean under arid climate. It is evident that optimum inter- and intra-row spacing can significantly improve crop yield (Ihasanullah, et al., 2002; Kabir & Sarkar, 2008). as an example , Kabir and Sarkar (2008) reported that the very best seed yield of mung was obtained by maintaining 30 × 10 cm spacing between rows and plants, respectively. Plant density of 40 plants m2 at 25 cm × 10 cm planting was the optimum for achieving higher productivity (Singh et al., 2011). Nawale (2001) concluded that the optimum plant population for mung was 667,667 plants per hectare obtained through the configuration of 30 and 10 cm between rows and plants within the row, respectively.

Conclusion

The study concluded that 124 Kg DAP ha-1 along side 10 tons of poultry litter were excellent combination for obtaining the utmost grain yield of mungbean crop. The farming community is advised to adapt recommendation for better production of mung-bean crop. Better crop yield and highest net returns might

be obtained from summer greengram (cv. GM-4) by sowing the crop with 30 cm x 10 cm spacing and fertilizing the crop with 100 % RDF (20-40-00 kg N-P2O5-K2O ha-1) in the medium black clayey soil under South Saurashtra Agro-climatic Zone of Gujarat. Consequently, the study has established and concludes that first, spacing significantly affects height, number of leaves at flowering, number of pods per plant, number of seeds per pod, seed weight, dry matter yield, grain yield and harvest index of mung beans. The optimum spacingfor an economic yield of mung beans (grain yield and harvest index) is established as 45 x 15cm as long as this is often the spacing that gives optimum plant population or density.combining spacing of 45 x 15cm and DAP at the speed of 100kgha-1 had a big effect on the expansion and yield of mung beans in Subukia in Nakuru County of Kenya. While it suffices to conclude that economic production of mung beans are often attained with this mix , it's also important to notice that interaction between the spacing of 45 x 15cm and up to 10tonsha-1 of FYM could provide an alternate combination where the value of inorganic phosphorus becomes a limiting factor.

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