Effect of Different Phosphatic Fertilizers on Yield and Economical Suitability of Mung bean (*Vigna radiata* L.)

Abstract

A field experiment was conducted at experimental farm, Department of Agronomy, A field experiment was conducted at experimental farm, Department of Agronomy, Faculty of Agriculture and Veterinary Sciences, Mewar University Gangrar, Chittorgarh (Rajasthan) during Rabi season of 2023-24 to effect of different phosphatic fertilizers on yield and economical suitability of mung bean variety "SML-832" was used in this study. The result revealed that the maximum yield parameter such as number of pods per plant (23.96), length of pod (5.78), number of seed per pod (7.68), grain yield (10.96 q/ha), straw yield (24.45 q/ha) and biological yield (35.43 q/ha) with application of T_9-40 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1}. The maximum Gross return (74500 Rs/ha), Net return (53700 Rs/ha) and B:C ratio (2.58) also recorded with T_9-40 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1}. It was concluded that the treatment T_9-40 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1} increases yield and economically suitable treatment for mung bean production.

Key words: -Phosphorus; Mung bean; Suitability & Pod length

1. Introduction

Green gram (*Vigna radiata* L.) commonly known as "mung" or "mung bean" is one of the most important and extensively cultivated pulse crop of the Indian sub-continent. Green gram or mung bean is one of the most ancient and extensively grown leguminous crops of India. It supplies protein requirement of vegetarian population of the country. India is one of the important mung bean growing countries in Asia with an area 8.7 million hectares and production of 8.83 million tonnes with a productivity of 1014 kg ha^{-1} (Anonymous., 2020). This popular and ancient crop is specially recognized as an excellent source of protein. It also plays an important role in maintaining and improving fertility of the soil through its ability to fix atmospheric nitrogen in the soil by root nodules. Despite of significant importance of this crop, the yield is very low in India as well as in Rajasthan probably due to the fact that, its cultivation is mainly confined under rainfed conditions and in poor fertility soils.

Phosphorus plays a key role in various physiological processes like root growth and dry matter production, nodulation and nitrogen fixation and also in metabolic activities especially in protein synthesis. It helps in establishing seedling quickly and also hastens maturity as well as improves the quality of crop produce. Phosphorus fertilization occupies an important place amongst the non-renewable inputs in modern agriculture. Crop recovery of added phosphorus seldom exceeds 20 per cent and it may be improved by the judicious management of phosphorus. As the concentration of available P in the soil solution is normally insufficient to support the plant growth, continual replacement of soluble P from inorganic and organic sources is necessary to meet the P requirements of crop (Tisdale *et al.* 2010).

It is also an essential constituent of majority of enzymes which are of great importance in the transformation of energy, carbohydrate metabolism, fat metabolism and also in respiration (catabolism of carbohydrates) in plants. It is closely related to cell division and development. Phosphorus stimulates seed setting, hastens maturity and enhanced protein content. It plays an important role in the nutrition of legumes and also improves biological nitrogen fixation and quality of grains (Kumar *et al.* 2009). It gives rapid and vigorous start to plants, strengthens straw and decreases lodging tendency.

2. Materials and Methods

A field experiment was conducted during Rabi season of 2023-24 at experimental farm, Department of Agronomy, Faculty of Agriculture and Veterinary Sciences, Mewar University Gangrar, Chittorgarh (Rajasthan). Soil of the experimental field was sandy loam intexture, saline in reaction with a pH value of 7.6, poor in organic carbon (0.32%), deficient inavailable zinc (0.48 ppm) and iron (1.2 ppm) low in available nitrogen (176 kg/ha) and phosphorus (20.2 kg/ha) but medium in available potassium (320 kg/ha). The experiment was laid out in randomized block design with three replications consisting of nine treatments *viz.* The experiment was laid out in randomized block design with three replications and ten treatments *i.e.* T_1-Control, T_2-20 kg P_2O_5 ha^{-1} from SSP, T_3-40 kg P_2O_5 ha^{-1} from SSP, T_4-20 kg P_2O_5 ha^{-1} from DAP, T_5-40 kg P_2O_5 ha^{-1} from DAP, T_6-20 kg P_2O_5 ha^{-1} from SSP + 100 kg Gypsum ha^{-1}, T_7-40 kg P_2O_5 ha^{-1} from SSP + 100 kg Gypsum + ha^{-1}, T_8-20 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1} and T_9-40 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1}. The required quantities of fertilizers as per treatments were applied. The doses of NPK were applied in the form of urea, diammonium phosphate, murate of potash respectively. The half dose of nitrogen gives basal dose and remain two split doses after irrigation and full dose of potassium at basal dose and phosphorus doses giving according to treatments.

3. Results and Discussion

3.1 Yield and yield attributes

The data showed (Table 1.0) that maximum number of pods per plant was obtained with T_9-40 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1} (23.96), it was found at par with T_8-20 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1} and T_7-40 kg P_2O_5 ha^{-1} from SSP + 100 kg Gypsum + ha^{-1} (22.65 and 21.36). The minimum number of pods per plant was recorded with control treatment (15.63). The data showed that maximum pod length was obtained with T_9-40 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1} (5.78), it was found at par with T_8-20 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1} and T_7-40 kg P_2O_5 ha^{-1} from SSP + 100 kg Gypsum + ha^{-1} (5.55 and 5.45). The minimum pod length was recorded with control treatment (5.02). The data showed that maximum number of seed per pod was obtained with T_9-40 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1} (7.65), it was found at par with T_8-20 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1} and T_7-40 kg P_2O_5 ha^{-1} from SSP + 100 kg Gypsum + ha^{-1} (7.55 and 7.52). The minimum number of seed per pod was recorded with control treatment (6.02). similar concluded by Muhammad *et al.* (2006), Ghulam *et al*. (2007), Jat *et al.* (2012), Patel *et al.* (2013), Kokani (2014) and Khaleeq *et al.* (2023).

The data showed (Table 2.0 and depicted Figure 1.0) that maximum grain yield was obtained with T_9-40 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1} (10.96 q/ha), it was found at par with T_8-20 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1} and T_7-40 kg P_2O_5 ha^{-1} from SSP + 100 kg Gypsum + ha^{-1} (10.05 and 9.88 q/ha). The minimum grain yield was recorded with control treatment (8.02 q/ha). The data showed that maximum straw yield was obtained with T_9-40 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1} (24.45 q/ha), it was found at par with T_8-20 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1} and T_7-40 kg P_2O_5 ha^{-1} from SSP + 100 kg Gypsum + ha^{-1} (23.15 and 23.02 q/ha). The minimum straw yield was recorded with control treatment (18.41 q/ha). The data showed that maximum biological yield was obtained with T_9-40 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1} (35.41 q/ha), it was found at par with T_8-20 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1} and T_7-40 kg P_2O_5 ha^{-1} from SSP + 100 kg Gypsum + ha^{-1} (33.20 and 32.90 q/ha). The minimum biological yield was recorded with control treatment (26.43 q/ha). Similar result also covered by Chaudhari (2015), Arsalan *et al.* (2016), Sardar *et al.* (2016), Singh *et al.* (2017), Rekha *et al.*, (2018) and Kumar (2022).

3.2 Economics

The data showed (Table 3.0) that maximum cost of cultivation was obtained with T_9-40 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1} (20800 Rs/ha). The minimum cost of cultivation was recorded with control treatment (15500 Rs/ha). The data showed that maximum gross return was obtained with T_9-40 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1} (74500 Rs/ha). The minimum gross return was recorded with control treatment (40100 Rs/ha). The data showed that maximum net return was obtained with T_9-40 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1} (53700 Rs/ha). The minimum net return was recorded with control treatment (24600 Rs/ha). The data showed that maximum B:C ratio was obtained with T_9-40 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1} (2.58). The minimum B:C ratio was recorded with control treatment (1.59). These findings also supported by Meena *et al.* (2015), Gohain and Jamir (2022) and Harika *et al.* (2023).

Conclusion: -

The findings of present investigation revealed that significant impact of different phosphatic fertilizers on yield and economical suitability of mung bean. Among all treatment T_9-40 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1} registered the maximum production with higher net return. So, it was concluded that the treatment 40 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1} superior among all treatments.

Table 1.0 Effect of different phosphatic fertilizers on yield attributes of mung bean

Treatments	Number of pods per plant	Pod length (cm)	Number of seed per pod
T_1-Control	15.63	5.02	6.02
T_2-20 kg P_2O_5 ha^{-1} from SSP	18.96	5.30	7.10
T_3-40 kg P_2O_5 ha^{-1} from SSP	20.36	5.38	7.35
T_4-20 kg P_2O_5 ha^{-1} from DAP	19.15	5.35	7.20
T_5-40 kg P_2O_5 ha^{-1} from DAP	21.22	5.42	7.42
T_6-20 kg P_2O_5 ha^{-1} from SSP + 100 kg Gypsum ha^{-1}	19.00	5.40	7.40
T_7-40 kg P_2O_5 ha^{-1} from SSP + 100 kg Gypsum + ha^{-1}	21.36	5.45	7.52
T_8-20 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1}	22.65	5.55	7.55
T_9-40 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1}	23.96	5.78	7.65
S.E. m ±	0.88	0.11	0.04
CD%	2.66	0.33	0.13

Table 2.0 Effect of different phosphatic fertilizers on yields of mung bean

Treatments	Grain yield (q/ha)	Straw yield (q/ha)	Biological yield (q/ha)
T_1-Control	8.02	18.41	26.43
T_2-20 kg P_2O_5 ha^{-1} from SSP	8.85	19.25	28.10
T_3-40 kg P_2O_5 ha^{-1} from SSP	9.25	21.36	30.61
T_4-20 kg P_2O_5 ha^{-1} from DAP	8.95	21.02	29.97
T_5-40 kg P_2O_5 ha^{-1} from DAP	9.48	22.63	32.11
T_6-20 kg P_2O_5 ha^{-1} from SSP + 100 kg Gypsum ha^{-1}	9.35	22.15	31.50
T_7-40 kg P_2O_5 ha^{-1} from SSP + 100 kg Gypsum + ha^{-1}	9.88	23.02	32.90
T_8-20 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1}	10.05	23.15	33.20
T_9-40 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1}	10.96	24.45	35.41
S.E. m ±	0.37	0.48	0.85
CD%	1.10	1.45	2.52

Table 3.0 Effect of different pphosphatic ffertilizers on economics

Treatment	Cost of cultivation (Rs/ha)	Gross return (Rs/ha)	Net return (Rs/ha)	B:C ratio
T_1-Control	15500	40100	24600	1.59
T_2-20 kg P_2O_5 ha^{-1} from SSP	16500	52500	36000	2.18
T_3-40 kg P_2O_5 ha^{-1} from SSP	17500	57000	39500	2.26
T_4-20 kg P_2O_5 ha^{-1} from DAP	16800	55100	38300	2.28
T_5-40 kg P_2O_5 ha^{-1} from DAP	17800	58200	40400	2.27
T_6-20 kg P_2O_5 ha^{-1} from SSP + 100 kg Gypsum ha^{-1}	18500	59500	41000	2.22
T_7-40 kg P_2O_5 ha^{-1} from SSP + 100 kg Gypsum + ha^{-1}	20500	66500	46000	2.24
T_8-20 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1}	18800	66280	47480	2.53
T_9-40 kg P_2O_5 ha^{-1} from DAP + 100 kg Gypsum ha^{-1}	20800	74500	53700	2.58

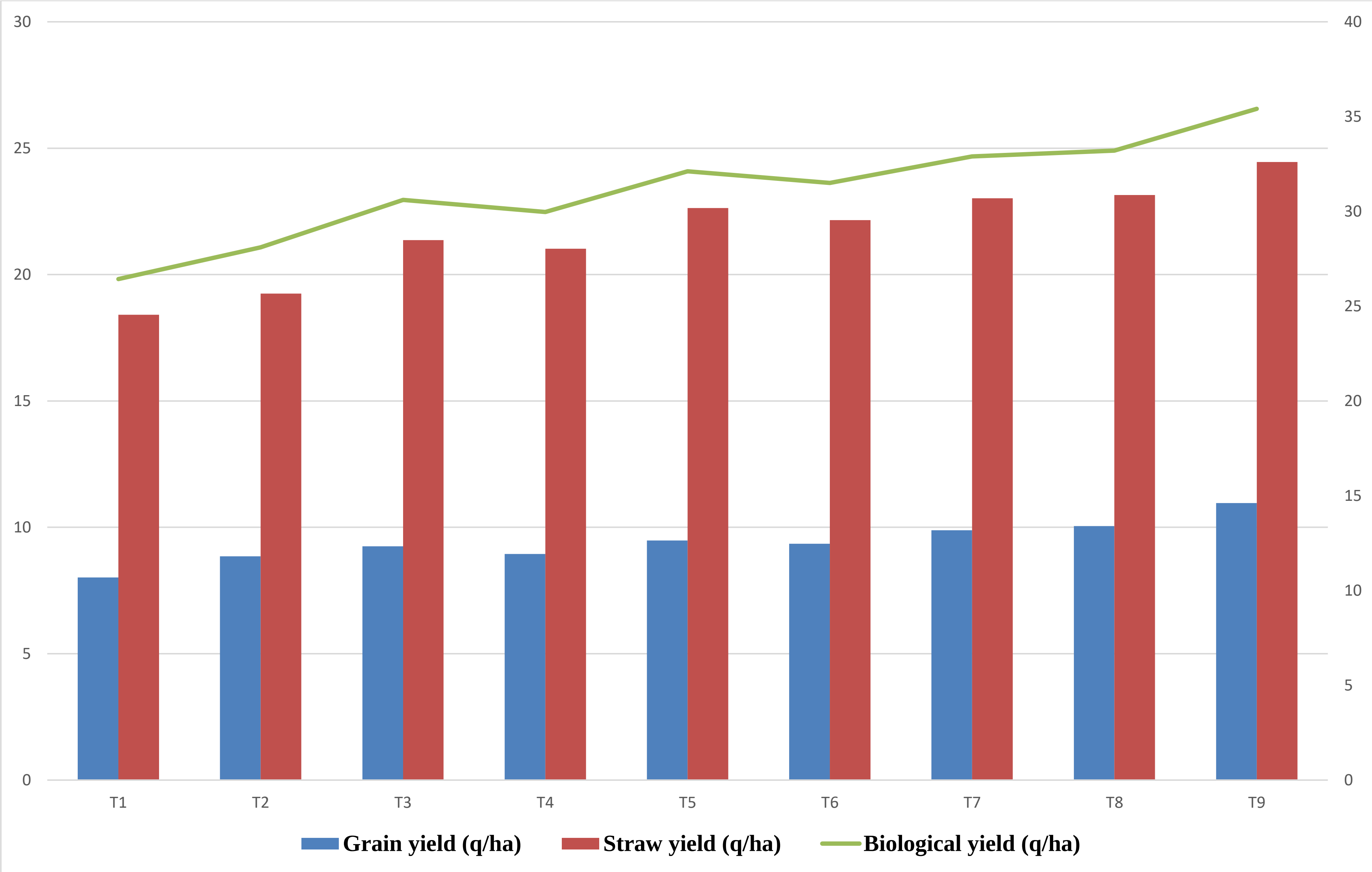

Figure 1.0 Effect of different phosphatic fertilizers on yields of mung bean

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