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**RESEARCH NOTE**

# Response of mothbean (*Vigna aconitifolia*) to different levels of fertilizers and organic manures in shallow black soils of northern dry zone of Karnataka

RUHEENTAJ, G. Y. VIDYAVATHI, I. M. SARAWAD AND V. S. SURAKOD

Department of Soil Science and Agricultural Chemistry
College of Agriculture, Vijayapur
University of Agricultural Sciences, Dharwad - 580 005
Karnataka, India
E-mails: ruhitaj77@gmail.com, vidyavathisac@gmail.com

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**Abstract:** A field experiment was conducted to assess the response of mothbean (*Vigna aconitifolia*) to different levels of fertilizers and organic manures in shallow black soils of northern dry zone- of of Karnataka at RARS, Vijayapur, University of Agricultural Sciences, Dharwad during *kharif,* 2018. The experiment was laid out in split plot design replicated thrice with four main plots consisted of organic manures *viz*., $M_1$- No organics (Control); $M_2$ - Vermicompost 0.5 t ha$^{-1}$; $M_3$- Vermicompost 1.0 t ha$^{-1}$ and $M_4$ - FYM 2.5 t ha$^{-1}$ and five sub plots consisted of different levels of fertilizers. Combined application of vermicompost @ 1.0 t ha$^{-1}$ and supply of fertilizer @ 12.5:25:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$ ($M_3S_4$) recorded highest plant height, dry matter accumulation, pod numbers per plant, test weight, grain yield and straw yield. Further, highest gross returns was recorded with same said treatment ($M_3S_4$) but maximum net returns and B:C was recorded with combined application of FYM 2.5 t ha$^{-1}$ + 12.5:25:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$ ($M_4S_5$) which was on par with vermicompost @ 1.0 t ha$^{-1}$ + fertilizer @ 12.5:25:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$ ($M_3S_4$)

**Key words:** Black soil, Fertilizer, Returns, Vermicompost

Mothbean [*Vigna aconitifolia* (Jacq.) Marechal] is an important pulse crop of the desert region and is remarkably well suited to arid and semi-arid areas of India and some other countries of Asia.In India, it is grown on an area of 13.19 lakh ha, mostly confined to Rajasthan, Gujarat, Maharashtra, Karnataka, Uttar Pradesh and Haryana with a production of 1,753 lakh t and productivity of 133 kg ha$^{-1}$ (Sadashivanagowda *et al*, 2017). It can very well stand drought conditions and is probably the most drought resistant crop among the grain legumes. The crop has spreading growth habit forming a mat like covering on the soil surface. It thus helps greatly in the conservation of soil, water and serves as a very efficient and suitable cover crop for checking soil erosion. The lower productivity of this crop is attributed to several factors *viz*., growing the crop under moisture stress, marginal lands with very low inputs, without proper nutrient management and other agronomical practices, without pest and disease management, non-availability of high yielding varieties and late sowing. This clearly shows that it is necessary to overcome these constraints to get higher yields. Yield is a complex character resulting from the interplay of nutrient management with the environmental variables and other factors.

With the increasing demand of pulses, there is an urgent need to increase their productivity, so combined use of fertilizers and organic manure not only give the great promise in crop production but also control the emergence of multiple nutrient deficiencies and maintain good soil health. Keeping this in view, an effort was made to investigate the Influence of different levels of fertilizers and manures on soil fertility, growth and yield of moth bean in shallow black soils of Northern Dry Zoneof Karnataka with objectives to know the influence of different levels of fertilizers and organic manures on growth, yield and economics of mothbean,

The field experiment was conducted at Regional Agricultural Research Station, Vijayapur in Northern dry zone of Karnataka (at latitude 160 491 N, longitude 750 431 E and altitude of 593 m above MSL) during *kharif* 2018. The experiment was laid out in split plot design replicated thrice with four main plots consisted of organic manures *viz*., $M_1$- No organics (Control); $M_2$ - Vermicompost 0.5 t ha$^{-1}$; $M_3$- Vermicompost 1.0 t ha$^{-1}$ and $M_4$ - FYM 2.5 t ha$^{-1}$ and five sub plots consisted of different levels of fertilizers *viz*., $S_1$- No inorganics (Control); $S_2$-7.5:15:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$; $S_3$-10:20:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$; $S_4$-12.5:25:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$; $S_5$-15:30:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$. The seed rate of 12 kg ha$^{-1}$ was used for sowing. Organic manures and fertilizers were applied as per treatments at the time of sowing. The biometric observations were recorded at regular time intervals during crop period and data were subjected to standard statistical analysis. The soil of the experimental site was shallow black clay loam having pH of 8.34 recorded by using potentiometric method, low in available nitrogen (175.00 kg ha$^{-1}$), medium in available phosphorous (33.0 kg ha$^{-1}$) and high in potassium (335.0 kg ha$^{-1}$).

The growth parameters like plant height (39.2 and 45.0 cm, respectively at 60 DAS and at harvest) and dry matter accumulation (9.48 and 20.43, respectively at 60 DAS and at harvest) were significantly higher in the treatment receiving vermicompost @ 1.0 t ha$^{-1}$ + fertilizer @ 12.5:25:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$ ($M_3S_4$). Similarly number of pods per plant (61.47), pod length of 8.67 cm and 100 seed weight of 1.96 gram was recorded in $M_3S_4$ (Table 1).

The grain yield (625.00 kg ha$^{-1}$) and straw yield (2340.00 kg ha$^{-1}$) was substantially higher in combination of vermicompost @ 1.0 t ha$^{-1}$ + supply of fertilizer @ 12.5:25:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$ than other combinations (Table 2). This increment might be attributed due to favourable influence of combined application of manures and fertilizers on sink component resulted to improved development of the plants in relations of yield attributes (pod length, pod numbers per plant and test weight) and growth attributes (plant height and DMA) on account of balanced nutrition and synergistic influence of combined incorporation as contrast to control. Present findings were in accordance with the study conducted by Raghwendra and Kedar (2008) in chickpea, Vadgave (2010) in green gram and Sadashivanagowda *et al.* (2017 a) in mothbean.

Table 1. Influence of different levels of fertilizers and organic manures on growth and yield attributes of mothbean

| Treatments | Plant height (cm) | | Dry matter accumulation (DMA) (g plant$^{-1}$) | | Pod numbers plant$^{-1}$ | Pod length (cm) | Test weight (100 Seeds) |
|---|---|---|---|---|---|---|---|
| | 60 DAS | At harvest | 60 DAS | At harvest | | | |
| Organics | | | | | | | |
| $M_1$ | 21.07 | 28.67 | 4.62 | 13.44 | 31.33 | 4.73 | 1.59 |
| $M_2$ | 32.21 | 39.10 | 6.39 | 16.06 | 47.41 | 6.14 | 1.62 |
| $M_3$ | 35.85 | 43.10 | 8.36 | 18.86 | 54.60 | 8.01 | 1.82 |
| $M_4$ | 34.02 | 41.60 | 8.05 | 18.39 | 54.85 | 7.80 | 1.74 |
| S.Em.± | 0.41 | 0.54 | 0.14 | 0.28 | 0.67 | 0.09 | 0.02 |
| C.D 5% | 1.41 | 1.87 | 0.48 | 0.96 | 2.31 | 0.32 | 0.08 |
| Fertilizer levels (S) | | | | | | | |
| $S_1$ | 27.46 | 34.42 | 6.04 | 15.65 | 42.97 | 5.80 | 1.62 |
| $S_2$ | 29.88 | 37.46 | 6.72 | 16.18 | 45.38 | 6.36 | 1.68 |
| $S_3$ | 31.48 | 38.79 | 6.88 | 16.85 | 46.84 | 6.84 | 1.68 |
| $S_4$ | 33.09 | 40.21 | 7.33 | 17.56 | 50.31 | 7.25 | 1.76 |
| $S_5$ | 32.04 | 39.71 | 7.31 | 17.19 | 49.75 | 7.09 | 1.73 |
| S.Em.± | 0.51 | 0.43 | 0.11 | 0.22 | 0.67 | 0.07 | 0.02 |
| C.D 5% | 1.46 | 1.25 | 0.32 | 0.64 | 1.94 | 0.19 | 0.05 |
| Interaction (M×S) | | | | | | | |
| $M_1S_1$ | 16.00 | 22.00 | 3.70 | 13.18 | 27.60 | 4.04 | 1.57 |
| $M_1S_2$ | 20.73 | 29.50 | 4.55 | 13.24 | 29.80 | 4.27 | 1.69 |
| $M_1S_3$ | 22.10 | 29.83 | 4.43 | 13.37 | 31.40 | 4.97 | 1.50 |
| $M_1S_4$ | 23.00 | 31.33 | 4.83 | 13.62 | 31.80 | 5.17 | 1.56 |
| $M_1S_5$ | 23.53 | 30.67 | 5.58 | 13.80 | 36.07 | 5.21 | 1.60 |
| $M_2S_1$ | 28.20 | 37.00 | 5.43 | 13.80 | 43.00 | 5.23 | 1.64 |
| $M_2S_2$ | 31.50 | 38.83 | 6.26 | 15.20 | 45.80 | 6.15 | 1.65 |
| $M_2S_3$ | 32.77 | 39.17 | 6.63 | 16.78 | 47.73 | 6.15 | 1.59 |
| $M_2S_4$ | 33.63 | 40.50 | 6.63 | 17.21 | 48.47 | 6.53 | 1.65 |
| $M_2S_5$ | 34.93 | 40.00 | 7.01 | 17.30 | 52.07 | 6.64 | 1.55 |
| $M_3S_1$ | 34.53 | 40.50 | 7.72 | 17.83 | 50.27 | 7.03 | 1.68 |
| $M_3S_2$ | 35.67 | 41.83 | 8.06 | 18.17 | 52.80 | 7.53 | 1.73 |
| $M_3S_3$ | 35.74 | 43.50 | 8.24 | 18.74 | 54.00 | 8.37 | 1.85 |
| $M_3S_4$ | 39.23 | 45.00 | 9.48 | 20.43 | 61.47 | 8.67 | 1.96 |
| $M_3S_5$ | 34.07 | 44.67 | 8.30 | 19.10 | 54.47 | 8.47 | 1.90 |
| $M_4S_1$ | 31.10 | 38.17 | 7.30 | 17.80 | 51.00 | 6.92 | 1.58 |
| $M_4S_2$ | 31.60 | 39.67 | 8.02 | 18.09 | 53.13 | 7.49 | 1.64 |
| $M_4S_3$ | 35.30 | 42.67 | 8.21 | 18.50 | 54.23 | 7.89 | 1.77 |
| $M_4S_4$ | 36.50 | 44.00 | 8.37 | 18.99 | 59.50 | 8.63 | 1.87 |
| $M_4S_5$ | 35.61 | 43.50 | 8.36 | 18.57 | 56.40 | 8.07 | 1.86 |
| S.Em.± | 1.00 | 0.95 | 0.24 | 0.48 | 1.38 | 0.15 | 0.04 |
| C.D 5% | 2.96 | 2.91 | 0.75 | 1.49 | 4.15 | 0.47 | 0.12 |

DAS: Days after sowing

M: Organic manures

$M_1$: No organics (Control)

$M_2$: Vermicompost 0.5 t ha$^{-1}$

$M_3$: Vermicompost 1.0 t ha$^{-1}$

$M_4$: Farm yard manure 2.5 t ha$^{-1}$

S: Fertilizer levels

$S_1$: No inorganics (Control)

$S_2$: 7.5:15:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$

$S_3$: 10:20:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$

$S_4$: 12.5:25:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$

$S_5$:15:30:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$

Significantly higher gross returns were noticed with combined application vermicompost @ 1.0 t ha$^{-1}$ + fertilizer @ 12.5:25:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$ ($M_3S_4$) and being comparable with FYM @ 2.5 t per ha + 12.5 :25:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$ ($M_4S_4$) as contrast to control (Table 2). However maximum net returns and benefit cost ratio was noticed with FYM @ 2.5 t per ha + 12.5 :25:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$ ($M_4S_4$) followed by VC @ 1.0 t ha$^{-1}$ + 12.5:25:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$ ($M_3S_4$) as contrast to control. This was because of higher cost incurred for vermicompost than FYM. These outcomes are in concordant with the reports of Subbarayappa *et al.* (2009) in green gram and Sutaria *et al.* (2010) in cowpea.

With the above results it was concluded that combined application of vermicompost @ 1.0 t ha$^{-1}$ + fertilizer @ 12.5:25:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$ or FYM @ 2.5 t ha$^{-1}$ + fertilizer @ 12.5:25:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$ found to be optimum for mothbean to realise higher grain yield and net returns in shallow black soils of northern dry zone of Karnataka.

Table 2. Influence of different levels of fertilizers and organic manures on yield and economics of mothbean

| Treatments | Grain yield (kg ha$^{-1}$) | Straw yield (kg ha$^{-1}$) | Gross returns (Rs ha$^{-1}$) | Net returns (Rs ha$^{-1}$) | B:C |
|---|---|---|---|---|---|
| Organics | | | | | |
| $M_1$ | 391 | 1468 | 21752 | 7755 | 1.55 |
| $M_2$ | 463 | 1718 | 25708 | 9320 | 1.57 |
| $M_3$ | 572 | 2124 | 31824 | 13237 | 1.71 |
| $M_4$ | 570 | 2081 | 31628 | 14941 | 1.89 |
| S.Em.± | 16.95 | 59.39 | 935.64 | 935.64 | 0.05 |
| C.D 5% | 59 | 206 | 3237 | 3237 | 0.17 |
| Fertilizer levels (S) | | | | | |
| $S_1$ | 438 | 1632 | 24336 | 9111 | 1.58 |
| $S_2$ | 485 | 1800 | 26946 | 10657 | 1.65 |
| $S_3$ | 501 | 1829 | 27806 | 11236 | 1.67 |
| $S_4$ | 537 | 1982 | 29807 | 12953 | 1.76 |
| $S_5$ | 535 | 1996 | 29745 | 12610 | 1.73 |
| S.Em.± | 6.62 | 30.47 | 366.79 | 366.79 | 0.02 |
| C.D 5% | 19 | 88 | 1056 | 1056 | 0.06 |
| Interaction (M×S) | | | | | |
| $M_1S_1$ | 296 | 1143 | 16532 | 4297 | 1.35 |
| $M_1S_2$ | 413 | 1553 | 22997 | 8983 | 1.64 |
| $M_1S_3$ | 414 | 1543 | 23031 | 8737 | 1.61 |
| $M_1S_4$ | 416 | 1503 | 23055 | 8476 | 1.58 |
| $M_1S_5$ | 415 | 1597 | 23145 | 8285 | 1.56 |
| $M_2S_1$ | 431 | 1650 | 24042 | 8653 | 1.56 |
| $M_2S_2$ | 452 | 1690 | 25135 | 8921 | 1.55 |
| $M_2S_3$ | 460 | 1689 | 25533 | 9038 | 1.55 |
| $M_2S_4$ | 485 | 1767 | 26917 | 10138 | 1.60 |
| $M_2S_5$ | 484 | 1797. | 26912 | 9852 | 1.58 |
| $M_3S_1$ | 513 | 1867 | 28467 | 10877 | 1.62 |
| $M_3S_2$ | 538 | 2021 | 29915 | 11500 | 1.62 |
| $M_3S_3$ | 566 | 2103 | 31455 | 12760 | 1.68 |
| $M_3S_4$ | 625 | 2340 | 34760 | 15781 | 1.83 |
| $M_3S_5$ | 622 | 2293 | 34523 | 15263 | 1.79 |
| $M_4S_1$ | 510 | 1870 | 28305 | 12616 | 1.80 |
| $M_4S_2$ | 537 | 1937 | 29738 | 13224 | 1.80 |
| $M_4S_3$ | 565 | 1980 | 31203 | 14408 | 1.86 |
| $M_4S_4$ | 620 | 2320 | 34498 | 17418 | 2.02 |
| $M_4S_5$ | 619 | 2299 | 34398 | 17038 | 1.98 |
| S.Em.± | 20.68 | 80.61 | 1142.77 | 1142.77 | 0.06 |
| C.D 5% | 67 | 257 | 3736 | 3736 | 0.20 |

M: Organic manures

$M_1$: No organics (Control) $M_2$: Vermicompost 0.5 t ha$^{-1}$
$M_3$: Vermicompost 1.0 t ha$^{-1}$ $M_4$: Farm yard manure 2.5 t ha$^{-1}$

S: Fertilizer levels

$S_1$: No inorganics (Control) $S_2$: 7.5:15:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$
$S_3$: 10:20:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$ $S_4$: 12.5:25:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$
$S_5$:15:30:0 N: $P_2O_5$: $K_2O$ kg ha$^{-1}$

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