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Growth and yield of mustard affected by solid and liquid manures

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Introduction and Importance

Agriculture has been a lifeline of rural economy in India and plays a vital role in the Indian economy. Over 70 per cent of the rural households depend on agriculture. Agriculture is an important sector as it contributes about 17% to the total GDP and provides employment to over 60% of the population. Indian agriculture has registered impressive growth over last few decades (Reddy, 2015). Agriculture not only provides food and raw material but also provide employment opportunities to a very large proportion of population.

Continuous use of fertilizers, the soil quality and fertility adversely affected and ultimately the human health. Dependence on chemical fertilizers for agricultural growth results in a further loss in soil quality and there is degradation of soil health and climate change (Patle *et al*.,2020). Hence, there is need of maintenance and enhancement of system productivity for sustainable agriculture.

Organic manures like farmyard manure, vermicompost and poultry manure are good source of nutrients containing organic matter upto 60% required by plants for better production and good quality produce. Vermicompost contains available nutrients necessary for plant growth and helps to improve plant health and acts preventively against fungal diseases. Scientific research conducted on the effects of vermicompost and result showed 30-50% increase in nitrogen uptake, increase in root length, root numbers and shoot length (Murali *et al*., 2018).

Indian mustard is one of the most important oil-seed crop belongs to the family Brassicaceae. India occupies second place after China in terms of production. After palm and soybean, mustard is the major oilseed crop in the world (Choudhary and Sangha, 2013). In the production of edible oil, it contributes 12% and 80% across the world and country, respectively. It is the second most important edible oilseed after groundnut which shares 27.8% in the India's oilseed economy (Bhanu *et al*., 2019). Rajasthan is the leading state which contributes more than 50% in terms of area and production. Other mustard growing states are Haryana, Uttar Pradesh, Madhya Pradesh and Gujarat.In India, contribution of rapeseed-mustard is 28.6% in the total production of oil-seeds (Choudhary and Sangha, 2013).

Indian soils are becoming deficient in N, P, and K along with S because of the use of high analysis fertilizers. Deficiency of these nutrients results in improper growth of plants and poor crop yield. Under such situation, organic manures can be utilized to magnify the soil health condition, production of crops and to improve fertilizer use efficiency (FUE). Nitrogen is the most important nutrient, which determines the growth of the mustard crop and increases the amount of protein and yield. Phosphorus and potash are known to be efficiently utilized in the presence of nitrogen. It promotes flowering, setting of siliqua and increase the size of siliqua and yield (Singh and Meena, 2004). Organic manures contain all the major nutrients as well as some minor nutrients in available form required by plants. So, the application of these fertilizers when applied in proper amount increases the crop productivity and also improves the soil structure.

REVIEW OF LITERATURE

Murali *et al*.(2018) conducted an experiment during Rabi season of 2017-18 at Research farm, College of Forestry, SHUATS, Allahabad. The experiment was laid out in randomized block design (RBD) with 9 treatments, each replication thrice. The result showed that maximum plant height (180.0 cm), maximum dry weight (139.83g), maximum number of branches(7.0) were recorded by the application of 50% FYM+ 50% VC. Also, higher seed yield (1.49 t/ha) and stalk yield (1.93 t/ha) were seen in the same treatment.

Kansotia *et al*.(2013) reported that the use of vermicompost up to 6 t/ha significantly increased the no. of branches/plant at harvest (23.09), no. of siliqua/plant (258.11), seeds/siliqua (20.78), test weight (4.93g). The seed yield (1456.00 kg/ha) and stover yield (1933.56 kg/ha) were found maximum by the application of vermicompost @6 t/ha respectively. Results of this study show that use of vermicompost can minimize the quantity of inorganic fertilizers and increase the physical properties of soil

Bhanwaria and Yadav (2016) stated that use of vermicompost @5 t/ha produced maximum pooled/combined grain yield (14.42 q/ha) and stover yield (35.94 q/ha) of mustard under all the organic manures over control. This experiment was laid out in split plot design with 27 treatment combinations replicated thrice. So, they concluded that application of 5 t/ha of vermicompost become more suitable for sustaining soil and crop productivity.

Soil pH measurement is useful because it is a predictor of various chemical activities within the soil. Although soil organic matter is the single most important constituent that influences the soil fertility, soil formation, soil physical and chemical properties which in turn reflects to the crop yield (Walker *et al*., 2004).

Aher *et al*.(2015) conducted an experiment to evaluate the influence of organic farming practices on soil health and crop performance of soyabean. The trail was laid out in randomized block design replicated three times and three management practices viz. organic, chemical and integrated (50:50). It was observed that soil organic carbon (11.3 g/kg), available N (125 mg/kg), P (49.7 mg/kg) and soil enzyme activities viz, dehydrogenase (98.20 µg TPF/g /day) and alkaline phosphatase (178.20 µg PNP/g^2/hr)were found significantly higher in organic farming practices while available K was not significant with respect to chemical and integrated practices. The total biomass (1927 kg/ha), seed yield (601 kg/ha) and

harvest index (31.19%) were found highest in organic farming practices.

Ram *et al*. (2020) conducted an experiment on panchgavya and jeevamrit which are used in different organic farming system and both are low cost bio-enhancer recommended for seed/seedling treatment, foliar and soil application in production of different crops. In view of this,

Swain *et al*. (2015) carried out a field experiment to study the effect of panchgavya on growth and yield of chilli cv. Kuchinda local. The results of the experiment revealed that foliar application of panchgavyaat 3% concentration at 10 days interval (6 sprays) produced higher plant height (80.17cm), no.of branches/plant (7.40), no. of leaves/plant (160.84), leaf area (80.17cm^2), no. of fruits/plant (169.45), no. of seeds/fruit (75.27), yield/plant (86.95g), yield/ plot (1.220 kg) and yield (21.95 q/ha).

Jadhav and Kulkarni (2016) studied the effect of foliar spray of nutrients on productivity of green gram in north-eastern transitional zone of Karnataka and reported that foliar spray of 19:19:19 (1 %) followed by panchagavya (5%) at flower initiation stage resulted significantly higher grainyield (1121 and 1105 kg/ha, respectively) when compared to other treatment. Also, plant height (54.1cm) and 1000grain weight (60.06g) were significantly increased by the use of 5% concentration of panchgavya.

Rao *et al*. (2018) studied the effect of organic foliar spray on productivity of green gram and concluded that growth and attributes of green gram viz., plant height, LAI, dry matter production, number of branches/plants, no. of seeds/pod, test-weight, seed yield were recorded higher in the foliar application of panchgavya + vermiwash + NAA at 15,30 and 45 DAS application.

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