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Evaluation Effect of Farmyard Manure (FYM) to Improve Cereal Crop Yield

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RESEARCH ARTICLE

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ABSTRACT

Manure plays an important role in improving physical, chemical and biological properties of the soil. Manures contain a low concentration of plant nutrients and they have a slow acting nature, organic manure alone may fail to tend the high nutritional requirements of crops. Organic manures including sheep manure, cattle manure and hen manure may be used for crop production as substitute of chemical fertilizers because the importance of organic manures cannot be overlooked. Organic farming has emerged as an important priority area globally in view of the growing demand for safe and healthy food and long term sustainability and concerns on environmental pollution associated with indiscriminate use of agrochemicals. Though the use of chemical inputs in agriculture is inevitable to meet the growing demand for food in world, there are opportunities in selected crops and niche areas where organic production can be encouraged to tape the domestic export market. Farmyard manure (FYM) is an important organic resource for agricultural production in livestock-based farming systems in the semi-arid regions. FYM refers to the decomposed mixture of dung and urine of farm animals along with their litter and fodder fed to the cattle. FYM is one of the components of Integrated Nutrient Management (INM) as it a cheap and easily available source of organic nutrients. Integrating Farmyard Manure with inorganic fertilizer, scientists are getting a very good response to the crop. The application of this source of organic improves the physical, chemical and biological condition of the soils. FYM can supply all the nutrients required by the plant and it is prepared by using cow dung, cow urine, waste straw, and other dairy wastes.

KEYWORDS: *Biofertilizer, Crop production, Nutrition, Organic matter, Soil fertility.*

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1. BACKGROUND

Organic manures including sheep manure, cattle manure and hen manure may be used for crop production as substitute of chemical fertilizers because the importance of organic manures cannot be overlooked (Abbas *et al*., 2012). Manure plays an important role in improving physical, chemical and biological properties of the soil. Manures contain a low concentration of plant nutrients and they have a slow acting nature, organic manure alone may fail to tend the high nutritional requirements of crops (Hossian *et al*., 2002). Many factors like soil fertility, imbalanced nutrition, disturbed soil properties, cultivars being grown weed infestation etc. limit its yield worldwide. Different management practices are adopted to increase and optimize the maize yields. For example, use of organic manures alongside inorganic fertilizers often lead to increased soil organic matter (SOM), soil structure, water holding capacity and improved nutrient cycling and helps to maintain soil nutrient status, cation exchange capacity (CEC) and soil's biological activity (Saha *et al.*, 2008). Although chemical fertilizers are important input to get higher crop productivity, but over reliance on chemical fertilizers is associated with decline in some soil properties and crop yields over time (Hepperly *et al.*, 2009). Therefore, an integrated use of inorganic fertilizers with organic manures is a sustainable approach for efficient nutrient usage which enhances efficiency of the chemical fertilizers while reducing nutrient losses (Schoebitz and Vidal, 2016). Synergistic effects of organic manures with inorganic fertilizers accumulate more total nitrogen in soils (Huang *et al*., 2007), but sole application of farm yard manure (FYM) resulted in increased yield of maize (Anatoliy and Thelen, 2007), higher SOM content (44%), improved soil porosity (25%) and 16 times more water holding capacity (Gangwar *et al*., 2006). Currently, 65 to 70 percent of the country's poultry diet is made of corn, which has made corn a strategic commodity in our poultry industry. Also unfortunately currently, about 70 percent of the country's corn is needed from abroad. So according the growing population, food security and importance of achieving self-sufficiency in agricultural production, especially in the production of maize, is one of the government's goals in the agricultural sector (Pouryousef Miandoab and Shahravan, 2014). Emmaline and Quirine (2016) reported by improve fertilizer management, potential of crop production increases and led to moderate effects of drought stress on plant growth. Regarding nutrient status of the soil, all three organic manures with inorganic fertilizers improved plant growth and yield with a significant improvement in NPK contents of the soil that affirmed enhanced nutrient use efficiency in the presence of organic manures. Organic amendments with reduced dose of chemical fertilizers might have resulted in elicited microbial activity and nutrient availability more than application of chemical fertilizer alone and/or unfertilized control. Application of organic amendments improved soil N, P and K concentrations when applied

with inorganic fertilizers (Hao *et al.*, 2008). Organic manures have more beneficial effects on soil quality than inorganic fertilizers thereby improving nutrient release and their availability to the plants (Birkhofer *et al*., 2008). Hence there is an urgent need to develop a suitable technology to use crop residues in the organic farming of wheat. Mixing the crop residues of cereals with well decomposed farmyard manure/compost/vermicompost or crop residue of legumes reduces the C:N ratio so as to overcome the adverse effect of N immobilization (Davari *et al*., 2012). Behera *et al*. (2007) reported that the application of available organic sources, particularly FYM and poultry mature along with the full recommended dose of mineral fertilizers to wheat was essential for improving productivity of wheat-soybean system. FYM serves as balanced nutritional manure for plants, improves soil biodiversity and represents a cost-effective fertilisation strategy. Physical properties like bulk density, porosity, void ratio, water permeability and hydraulic conductivity were also significantly improved when FYM was applied. Similarly, compost application increases the availability of essential micro- and macronutrients for the crop and can improve physical and chemical properties of the soils. The tiller, plant height and biomass were also significantly increased. Using compost and FYM helped farmers to increase yields, while contributing to decrease the use of chemical fertilizer and improving soil texture for successive crops. Davari *et al*. (2012) by evaluate effect of different combinations of organic manures, rice residues (RR) and biofertilizers in organic farming of wheat reported that application of vermicompost (VC) + crop residue + bio fertilizers (*Azotobacter* + cellulolytic culture + *Pseudomonas striata* or PSB) was the most productive treatment but FYM + crop residue + biofertilizers was the most economical treatment with respect to increasing net profit. This was because of the higher price of vermicompost compared with FYM. Both of these combinations resulted in improved grain quality and nutrient uptake by grain. The present study thus indicates that a combination of FYM + RR + biofertilizers or VC + RR + biofertilizers holds promise for the organic farming of wheat. Helfenstein *et al*. (2016) by compare organic and conventional wheat cropping systems with respect to DTPA (diethylene triamine pentaacetic acid)-extractable Zn in plant available Zn, yield and grain Zn concentration traits reported organic farmers in that study thus attained statistically significant and nutritionally relevant increases in grain Zn concentration. So organic farmers led to increase in grain Zn concentration without compromising yield. The discussion addresses possible underlying mechanisms for the results of that regression analysis, as summarized in Fig. 1.

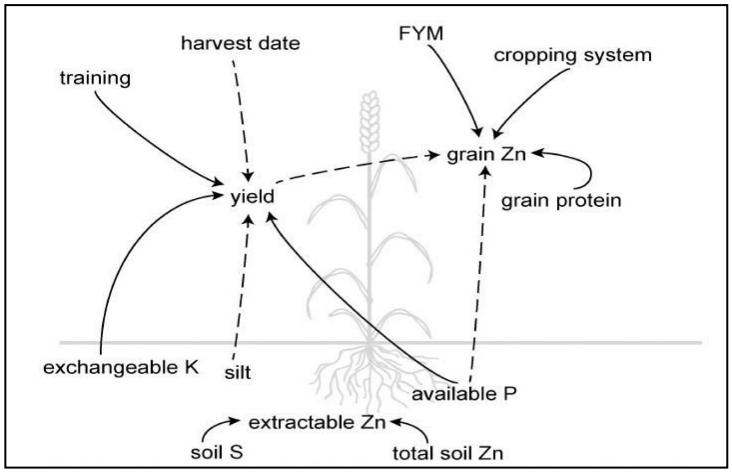

Fig. 1. Schematic diagram of correlations as determined by multiple linear regressions in the case study area.

Solid lines refer to positive, dotted to negative effects. While soil available P had a positive effect on yield, it was negatively correlated to grain Zn concentration. Yield also has a negative relationship with grain Zn concentration. Organic farmers had improved grain Zn concentrations because they tended to have lower levels of available P in the soil but higher grain protein concentrations. Organic farmers were able to maintain yield levels of conventional farmers by compensating for the lack of chemical fertilizers (lower available soil P levels) with improved nutrient management training.

2. OBJECTIVES

Current research was carried out to assess the response of effective traits on cereal crop production to apply farm yard manure (FYM).

3. EVIDENCE ACQUISITION

Current research was conducted according evaluate results of valid researcher.

4. RESULT AND DISCUSSION

Vermicomposting technology involves the bio-conversion of organic waste into vermicasts and vermiwash utilizing earthworms (Jadia and Fulekar, 2008). These earthworms feed on the waste and their gut act as the bioreactor where the vermicasts are produced (Ansari and Sukhraj, 2010). Worms Composting of organic wastes would increase the availability of nutrients within the organic wastes, will increases photosynthesis (chlorophyll and pigments) and plant biomass. In an experiment the application of vermicompost increased the amounts of anthocyanin and flavonoids in plants (Joshi *et al*., 2014). In several studies, the importance of organic wastes in the preparation of compost and vermicompost and the role of these organic fertilizers in sustainable agriculture and the growth, yield and macro- and micronutrient content of plants have been discussed (Hernandez *et al*., 2015).

These vermicasts are also termed vermicompost and are rich in nitrogen, phosphorous, potassium and micronutrients (Palanichamy *et al.,* 2011). Effect of these vermicompost on plant growth is well reported but mostly it used as a main source of nitrogen. Increasing the vermicompost quantity also promoted plant growth as well as growth of the cob webs by increasing the zinc and phosphorous like nutrients. Zinc enhances plant growth regulation whilst phosphorous promotes plant growth (Abbasi *et al.,* 2009; Manyuchi *et al*., 2013a; Manyuchi *et al.,* 2013b). Increasing the level of phosphorous content in the soils also promoted plant growth, high resistance and quality of seed. Furthermore, it was well documented that increasing the application time of both the vermicompost and vermiwash also increased the soil copper, iron and phosphorous content (Manyuchi *et al*., 2013c; Nath and Singh, 2012). This increase in soil nutrient content promoted plant growth and chlorophyll production; hence boost the overall corn growth. In addition, microbial activities was also reported higher in the soil treated by vermicompost and this higher microbial activity also affected the production of plant growth regulators such as cytokinins as well as humic acid which promote plant growth (Gopal *et al.,* 2010; Manyuchi *et al.,* 2013d). Considering to the environmental pollution caused by the indiscriminate use of nitrogen fertilizers, development of biological strategies for safe and cost-effective option for management of nitrogen in order to reduce the dangers of indiscriminate use of it, is one of the priority in the sustainable agriculture (Sahoo *et al*., 2013). Organic farming has emerged as an important priority area globally in view of the growing demand for safe and healthy food and long term sustainability and concerns on environmental pollution associated with indiscriminate use of agrochemicals. Though the use of chemical inputs in agriculture is inevitable to meet the growing demand for food in world, there are opportunities in selected crops and niche areas where organic production can be encouraged to tape the domestic export market (Venkatash-Warlu, 2008). Alizadeh Dehkordi (2010) reported combination cow manure and urea fertilizer, even under drought stress, produce higher yield than to use urea fertilizer alone. Ghanbari *et al*. (2013) reported use 50% of manure + 50% of fertilizer treatment had the greatest effect on increasing forage yield, seed yield and barley yield components. Also that treatment had the highest accumulation of macro and micro elements in the seed. In other words, the integrated fertilizer and chemical fertilizer system as an effective solution to improve soil fertility and increase nutrient uptake has greatly improved the quality and quantity of barley. Fallah *et al*. (2007) reported that a combination of manure and inorganic fertilizers increased maize yield than to use of mineral fertilizer alone. The reason for this is the role of livestock manure in improving soil structure and providing some of the low-consumption elements as well as essential elements of the plant by mineral fertilizers. Cheraghi *et al*. (2016) studied the effect of organic ma-

nure and phosphorus fertilizer on yield and yield components of bread wheat and reported that the combined application of organic manure or vermicompot with chemical fertilizer has a better effect on yield and yield components of common wheat rather than single application. On the other hand combined application of organic and chemical fertilizers had more efficiency due to some positive interaction between their microorganisms in the soil that led to a synergistic effect and therefore lead to an increase in seed yield. Some researcher such as Abakemal *et al*. (2016) and Birendra *et al*. (2016) reported same result. The combined use of chemical fertilizers and Nitroxin, by preventing loss due to use bio-fertilizer nitrogen, the more nitrogen, the amount of protein in the treatments increased (Yousef poor and Yadvy, 2014).

5. CONCLUSION

Application of Farmyard Manure (FYM) is known to keep soil productivity longer than inorganic fertilizers. FYM contains all the macro- and micronutrients required for plant growth, but its main effect is due to nitrogen, phosphorus, and potassium. Also, the maintenance of organic matter in the soil is important for improving the nutrient and structural status of soils. Apart from its nutritional role, Farmyard Manure controls the dynamics of all the macro- and micronutrients. Partially rotten Farmyard Manure should normally be applied 3 to 4 weeks before sowing the crops. This FYM will decompose in moist soil to improve the soil structure and release the nutrients contained in it, in the soluble form for growth of the crop. If Farmyard Manure is applied too long before sowing the crop, the nutrients are lost by leaching by rainwater. Well-rotted Farmyard Manure must be thoroughly worked into the soil just before the crop is sown. The application of Farm Yard Manure to young vegetable and fruit plants have given the best results. FYM contains a low amount of phosphorus, it must be used in conjunction with single super phosphate (Bone meal to acid soils) as a basal dose and nitrogenous fertilizers should be used as a top dressing.

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FOOTNOTES

CONFLICT OF INTEREST: Author declared no conflict of interest.

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