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EFFECT OF ORGANIC MANURES AND THEIR LEVELS ON WEEDS DENSITY AND MAIZE YIELD

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ABSTRACT

Organic manures are known to be the most important soil amendments for improving soil fertility and crop productivity by releasing different essential nutrients and improving the soil properties. The present experiment was conducted to study the effectiveness of different types of organic manures alone or their combination in equal proportion and their levels on weeds density and maiz[1]e yield. Two types of manures (sheep manure and farmyard manure-FYM) and their combination in equal proportion were used at three different levels (4, 6 and 8 tons ha^{-1}). The results indicated that higher weed density (39 m^{-2}), weed fresh biomass (261.59 g m^{-2}) and weed dry biomass (102.33 g m^{-2}) were recorded in plots treated with FYM, whereas sheep manure alone proved superior in terms of grain yield (2400 kg ha^{-1}). Among different levels of manures, 8 tons ha^{-1} of manure produced higher number of weeds (37.67 m^{-2}), greater weed fresh (263.01 g m^{-2}) and dry (97.44 g m^{-2}) biomass, and higher grain yield (2438 kg ha^{-1}). It is concluded that sheep manure applied at the rate of 8 tons ha^{-1} resulted in higher yield of maize and lower weeds number and biomass.

Key words: farmyard manure, maize, sheep manure, weeds, yield.

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INTRODUCTION

Maize being the highest yielding cereal crop in the world is of a significant importance for countries like Pakistan, where rapidly increasing population has already out stripped the available food supplies. Maize ranks third among most grown crops in the world and

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cultivated on area of more than 184 million hectares with an annual production of about 1.02 billion tons (FAO, 2013). In Pakistan, maize is the third largest grown crop after wheat and rice. The area under maize cultivation is 1.1 million hectares and production 4.5 million metric tons (MNFSR, 2014). Punjab contributes 39% of the total area under maize and 30 per cent of total production; Khyber Pakhtunkhwa (KP) contributes 56 percent of the total area and 63 percent of the production; while, five per cent of the total area and three per cent of the total production is contributed by Sindh and Baluchistan, respectively.

The yield of maize however, varies among genotypes, locations and also depends on the availability of essential factors such as soil nutrient status and proper application of fertilizers. In Pakistan, the yield potential of crops is not being fully exploited due to many constraints. Among those, inappropriate nutrients supply ranked first due to the high fertilizer costs, marketing problems and poor infrastructures are some of the major reasons for low use of fertilizer (Oad *et al.*, 2004). Generally the soil of Pakistan is very poor in organic matter due to lower use of organic fertilizer and rapid decomposition of the organic matter. Apart from the consumption of large amount of energy and monetary resources during synthesis of chemical fertilizers, its continuous use is a serious threat to environment as well as exerts detrimental effects on soil properties (Oad *et al*., 2004). However, an organic farming with or without chemical fertilizers seems to be possible solution for these situations (Prabu *et al.,* 2003). The integration of organic and inorganic sources of nutrients not only supply essential nutrients but also have some positive interaction with inorganic fertilizers to increase their efficiency and thereby reduce environmental hazards (Ahmad *et al.*, 1996). Organic fertilizers including farmyard and sheep manures may be used for the crop production in addition with chemical fertilizers to sustain soil fertility and productivity.

Beside imbalance supply of nutrients to the soil there are several other factors responsible for yield reduction, in which weeds infestation is one of the important constraints. Weeds reduce crop yield by competing for the available resources like water, nutrients, and light (Rajcan and Swanton, 2001). Several studies shown that crop losses due to weed competition throughout the world as a whole, is higher than those resulting from the combined effect of insect-pests and diseases (Hassan *et al*., 2005). Weeds could reduce maize yield by 70-80% (Usman *et al*., 2001) and hence strategic weed management is important to obtain higher yield in small land holding system. Therefore current study was conducted to investigate the weed

infestation under the organic nutrients (manures) management in maize crop.

MATERIALS AND METHODS

An experiment was conducted to study the effect of different organic manures on maize growth and weed infestation at the Agriculture Research Station, Harichand, Charsadda, Khyber Pakhtunkhwa, Pakistan in summer 2015. Different organic manures (Farmyard manure, Sheep manure and their combination in equal proportion—FYM+Sheep manure) were used at three different levels (4, 6 and 8 t ha^{-1}). The manures were applied two weeks before sowing and plots with no manure application were designated as a control, in the experiment.

The experiment was laid out in randomized complete block design with three replications. A plot size of 4 m x 3.5 m was used with 5 rows 70 cm apart and 4 m long. The field was ploughed twice with cultivator followed by planking and prepared fine seed bed for sowing. Maize cultivar Azam was sown in the first week of July at the seed rate of 30 kg ha^{-1} and was harvested in mid October. Proper plant population 65000 plants ha^{-1} was maintained by thinning. All the agronomic practices including application of recommended inorganic fertilizer doses and irrigation were kept constant for each experimental unit. The details of the factors and levels were as follows:

Factor A: Manures

1. Farmyard manure (FYM)
2. Sheep manure
3. Half FYM + half Sheep manure

Factor B: levels of manures (tons ha^{-1})

1. 4
2. 6
3. 8

Data were recorded on weeds density m^{-2}, weed fresh weight (g m^{-2}), weeds dry weight (g m^{-2}), and grain yield of maize. Weeds density was measured by counting weeds in $1m^2$ area at three random places in each plot at 30 days after sowing. Fresh and dry weights of the samples were taken.

Statistical analysis

The data were analysed by using analysis of variance techniques (ANOVA) for RCB design and LSD test was used upon significant F-test as described by Jan et al. (2009).

RESULTS AND DISCUSSIONS

Weeds Density (m^{-2})

Weeds density significantly varied under different manures application as well as their levels, whereas the interaction effect was found non significant (Table 1). Mean values of the data indicated that the control plots produced less number of weeds m^{-2}(30) as compared to fertilized plots (36). Regarding manure types it was observed that weed density was higher (39 m^{-2}) in the plots treated with FYM, whereas lower weed density (34.11 m^{-2}) was observed in the plots treated with sheep manure. The increase in weed density due to the FYM application might be attributed to the fact that FYM serves as a vector for spreading weed seed. Similar results were noticed earlier by Boguzas *et al*. (2010) who reported that addition of FYM considerably increased the number of weeds from 96.5 to 323.8% as compared to green manuring. Lazauzkas (1990) also concluded that application of FYM at the rate of 60 kg ha^{-1} brought 0.5 to 40 million of weed seeds.

Weeds fresh and dry weight (g m^{-2})

Data regarding weeds fresh and dry weight revealed significant effect of manures and their levels, whereas their interaction was not significant (Table 1). Mean values of the data indicated that the weeds fresh and dry biomass (252.75 and 93.13 g m^{-2}) was higher in fertilized plots as compared to control plots (211 and 73.85 g m^{-2}). In case of manure types, weed fresh and dry biomass was higher (261.59 and 102.33 g m^{-2}) with the incorporation of FYM whereas lower biomass was observed with sheep manure (244.97 and 88.19 g m^{-2}). The results further indicated that manures applied at the rate of 6 and 8 tons ha^{-1} produced higher weeds fresh biomass (254.61 and 263.01 g m^{-2}), whereas weeds fresh weight was lower (240.62 g m^{-2}) with 4 tons ha^{-1}. Similarly, the dry weight of weeds was higher (97.44 g m^{-2}) with the addition of 8 tons organic manure and dry biomass of weeds reduced with decreasing level of manure. These results suggest that various types and amount of manures can affect the weeds biomass due to the availability of nutrients. The higher biomass in the FYM treated plots may probably be due to the fact that FYM has the potential of introducing weed seeds which resulted in more number of weeds m^{-2} and hence increased the weeds biomass. Similar results were reported earlier by Liebman and Davis (2000) who found higher weed biomass in FYM treated plots.

Grain yield (kg ha^{-1})

Grain yield of maize was significantly affected by different types and level of manures, while the interaction between the two factors was not significant (Table-1). The control plots produced lower grain yield as compared with the manures fertilized plots. Regarding types of manures, sheep manure produced more grain yield as compared to

lower grain yield produced by combine application of FYM and sheep manure. Moreover manures applied at the rate of 8 tons ha^{-1} produced higher grain yield, whereas lower grain yield was obtained with 4 tons ha^{-1}. The higher grain yield due to application of sheep manure might be the fact that the C:N ratio of sheep manure is narrow as compared to FYM and it contain comparatively large amount of nutrients which lead to timely availability of the nutrients in low fertile soil providing a conducive environment for vigorous growth of plants. Wanyo et al. (2013) reported similar results and suggested that sheep manure is superior to FYM in terms of grain yield. These results are also supported by Ofosu-Anim and Leitch (2009) who concluded that sheep manure increased chlorophyll content and hence produced more yield.

Table-1. The effect of sheep and farm yard manure application alone or their combination in equal proportion at three different levels on weeds density, fresh and dry weight and maize yield.

Manures	Weeds density (m^{-2})	Weeds fresh weight (g m^{-2})	Weeds dry weight (g m^{-2})	Grain yield (kg ha^{-1})
Sheep (S)	34.11 c	244.97 b	88.19 b	2400 a
FYM (F)	39.00 a	261.59 a	102.33 a	2101 b
1/2 S + 1/2 F	36.11 b	251.69 ab	88.87 b	2020 c
LSD $_{(0.05)}$	1.54	11.4663	3.148819	89
Levels (t ha^{-1})				
4	35.11 b	240.62 b	89.06 c	1950 c
6	36.44 ab	254.61a	92.89 b	2233 b
8	37.67 a	263.01 a	97.44 a	2438a
LSD $_{(0.05)}$	1.54143	11.4663	3.148819	89
Control vs rest	*	*	*	*
Control	30.00	211.00	73.85	1000
Rest	36.41	252.75	93.13	2213
Interaction				
M x L	NS	NS	NS	NS

Means followed by different letters are significantly different in the same category. *= significant at 5% level of probability, NS = non significant.

CONCLUSION

It is concluded that 8 tons ha^{-1} of sheep manure alone proved superior in terms of low weeds biomass and higher maize yield as compared to FYM application that resulted in high weeds density and biomass.

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