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ORGANIC FERTILIZERS AFFECT THE GROWTH ATTRIBUTES OF WEEDS AND SWISS CHARD

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ABSTRACT

Swiss chard (Beta vulgaris L.) is one of the most nutritive leaf vegetable used by people throughout the world. In Pakistani soil inadequate nutrients especially organic fertilizers is one of the major constrain to Swiss chard production and competition of weeds to the crops. An experiment entitled "organic fertilizers affect the growth attributes of weeds and swiss chard" was carried out in one factor Randomized Complete Block Design (RCBD) conducted at Horticultural Research Farm, The University of Agriculture Peshawar, Pakistan during the year 2015. Different organic fertilizers (FYM, poultry manure and compost) were used, organic fertilizer (Poultry manure) significantly affected all the growth attributes less days to germination (6.67), highest number of leaves (10.33), number of branches (9.33) and less days to harvest time (43) of Swiss chard and minimum weeds density (146 m^2), fresh (233.33 m^2) and dry weight (61.66 m^2) weeds. Anagallis arvensis L. is the most common and highest number (41%) weed found during the crop growing season stage. Poultry manure recommended for the growth of Swiss chard and reducing weeds.

Key words: Swiss chard, organic fertilizers, weeds, growth.

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INTRODUCTION

Swiss chard (*Beta vulgaris* L.) is a member of the Chenopodiaceae (goosefoot family) [Steinmetz and Potter, 1996]. It is a short period valuable vegetable species and ready to harvest after planting about 40 to 60 days (Swiader *et al.,* 1992). It grows best at a

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temperature ranges from 7-24^{0}C. Well drained and well organic soil is best for its cultivation. It requires frequent irrigation of its succulent behavior to ensure that the soil is not dry out to less than 50% of available water (Nennock, 1989). Inorganic fertilizer remains on the surface of the soil after heavy rain resulting in surface runoff and leaching of the nutrient occur. Excessive use of inorganic fertilizers results in salt accumulation in the soil and forces the plant to spend more energy to take the water from the soil and results in low yield or the complete wilting of plant (Macias *et al*., 2003).

Organic based fertilizers are less leached into ground water than the chemical fertilizers. As a result of this fact the use of organic based fertilizers has found favour in boosting crop production in Pakistan, because it is cheap and less likely to pollute the ground water as much as the chemical fertilizers (Moreira, 2003). Organic fertilizers enhance the soil fertility, improve soil structure, water holding capacity, physical and chemical properties, soil pH, microbial activity and also crop production in term of yield (USDA, 2005). Maintenance of the field for longer period of time, organic fertilizer is used for fertility up to hundreds years. These manures have the ability to reduce soil pH, enhance electrical conductivity and nutrient absorption (Davarnejad *et al.* 2002). Farmyard manure or compost is use in sustainable agriculture. These materials play an important role to enhance the physical properties of the soil, such as bulk density, improve microbial activities, water absorption and nutrient availability to the plant.

Compost is one of the important organic fertilizer which contains 10-20% of moisture, pH ranging from 6-8, Electrical conductivity 6 Ds/m, Neutral solute material 3-12.5%, Organic carbon 19-22%, Organic nitrogen 1.3%, Organic material 30-40%, Ash 50-55%, carbon nitrogen ratio (C:N) 13.5-18.5 and Phosphorus 1-1.22%. Farm Yard Manure contains moisture content 20%, Organic nitrogen 0-25%, Carbon Nitrogen ratio 12 and Phosphorus 0.3% (Mohanty *et al.,* 2006). A weed control is require efficiently is to reduce the cost of small holder farmers. A short term management of weeds for a season and specific crops weeds but they create long term problems (Sloan, 2002). Advances in management techniques for weeds control, greater attention to reduce weed seed bank, emergence, retard growth and interference with the crops are developed (Higa *et al*., 1994). Natural and organic weeds control such as placement, types, concentration and quality use have the potential to resist the soil for weeds germination and crops get compete to weeds (Goh, 2003). The study was designed that to minimize the growth of weeds and enhance the growth and yield of Swiss chard with the application of organic fertilizers.

MATERIALS AND METHODS

An experiment entitled "Organic fertilizers affect the growth attributes of weeds and swiss chard" was carried out in Randomized Complete Block Design (RCBD), at Horticultural Research Farm, The University of Agriculture Peshawar, Pakistan during the year 2015.

Experimental Design

The experiment comprises one factor, replicated three times and having 12 experimental units. Different Organic fertilizers (FYM, Poultry manure and Compost) with a control were used in the experiment. FYM and Compost were applied at 1 kg m^{-2}, while poultry manure was applied at 0.8 kg m^{-2}.

Soil preparation and other cultural practices

One month before the seed sowing field was prepared. After field preparation well rotten organic fertilizer were applied to each plot according to our experimental design. The seeds were sown on 15th September. The seed depth was kept 3cm with plant-plant and row-row distance of 25 and 50cm, respectively. The fertilization of the field was made through application of Urea and SSP at the time of seed sowing.

Data collection

Data were recorded on days to germination, number of leaves $plant^{-1}$, leaf area (cm^2), number of branches $plant^{-1}$, days to harvest, weeds density m^{-2}, fresh and dry weeds biomass (g m^{-2}). The days were counted from the seed sowing up to the emergence of the 50% seedlings. Numbers of leaves data were recorded by randomly selecting six plants from each treatment in each replication and average number of leaves calculated then. Number of branches calculated from randomly six plants and then their average was calculated. Leaf area was calculated from six plants through leaf area meter. Days required to harvest were counted from seed sowing up to the harvesting of the plants from each replication in each treatment. After one month of seeds germination weed density was recorded from randomly selected two central rows from each experimental unit and was averaged to get weeds density m^{-2}. Fresh data on that time and then put for drying data were recorded from that weeds density data selected samples.

Weed Flora identification and percentage

Different weeds were identified and calculated their percentage in the field during the course of the experiment which are given in Table-3.

Statistical analysis

The data recorded on different parameters were analyzed by using the statistical computer software (Statistic 8.1). The significant means were separated by using LSD Test (Steel *et al*., 1997).

RESULTS AND DISCUSSION

Swiss chard

Data regarding days to germination, number of leaves plant^{-1}, number of branches plant^{-1} and days to harvest significantly affected by organic fertilizers, while leaf area (cm^2) was found non-significant on Swiss chard (Table-1). Less number of days for germination (6.67) was observed on poultry manure application, while more number of germination (9.33) days were noted on control treatments. Plants contain higher leaves (10.33) plant^{-1} was obtained from poultry manure treatment and treated with no treatment number of leaves (5.33) plant^{-1} were counted. Plants contain higher branches (9.33) plant^{-1} was obtained from poultry manure treatment and treated with no treatment number of branches (5) plant^{-1} were counted. On poultry manure plots minimum days to harvest (43), similarly followed by compost (45) days, while maximum days (52) to harvest were noted from control plots.

The increase in growth attributes in Swiss chard due to poultry manure application may have direct role in plant nutrition. Nitrogen fertilizers enhance vegetative growth. Poultry manure enhances the vegetative growth and with its high nutritive ability provides available nutrients to the plants under stress condition (Khalil *et al*., 2005). It might be because of media containing organic manures possess organic acid within them. Therefore, it provides more moisture and some acids condition may have helped in minimum days to germination and better germination percentage (Bisla *et al*., 1984). Poultry manure provides sufficient amount of nutrients that accelertae the growth of leaves (Anyaegbu *et al*., 2010). It may be due to better nutrient availability leading to higher production of photosynthetically functional leaves due to growing media (Borah *et al.,* 1994). These findings are in conformity with those reported by Sudhakara *et al.* (1995) in *Ceiba pentandra* Linn. Poultry manure reduces carbon nitrogen ratio for better performance in soil (Maerere *et al*., 2001) leading to an increase in growth, branch formation and leaf production. Increases in number of leaves as a result increased the number of branches; the leaves provide more photosynthesis to the branches (Borah *et al.,* 1994). In the poultry manure plots there were lesser number of weeds for competition with the crop and the seeds take minimum numbers of days to germination. The poultry manure plots contain more nutrients for fast growth and plants reached to

maturity early and take less days. It produced heat; improved organic status, water holding capacity and electrical conductivity.

Weeds (m^{-2})

The organic fertilizers treatments significantly affected weed density m^{-2}, Weeds fresh and dry biomass on Swiss chard (Table-2). Highest weeds population was observed in compost plots (177 weeds m^{-2}), which was at par with FYM treatment (175 weeds m^{-2}), whereas poultry manure treatment resulted in lower weed population (146 m^{-2}). Highest fresh weed biomass (348.66 g m^{-2}) was noted on compost, which was at par with FYM (336.66 g m^{-2}) fresh and dry weed biomass (86.66 g m^{-2}) was recorded in FYM plots, similarly followed by compost plots (85.50 gm m^{-2}), whereas lowest weed fresh biomass (233.33 gm m^{-2}) and dry weed biomass (61.66 g m^{-2}) were recorded in poultry manure treatments.

The superiority of farm yard manure and compost in terms of enhancing weeds population could be explained from the fact that FYM and compost usually contains seed of indigenous weed species and also essential nutrients required for rapid weeds growth. Similar results are reported by Ali *et al*. (2011) who found higher weeds density in FYM and compost amended plots. Similar results are also reported by Jama *et al*. (1997) who stated that application of organic manures resulted in higher weeds biomass and weeds density. Weeds compete for nutrients in the soil with Swiss chard, in FYM and compost the weeds seeds are more and absorb more nutrients from it as compare to crops. Poultry manure contains less seeds of weeds and the plants growth is faster than weeds (Major *et al*., 2005). Application of FYM and compost may have increased the amount of available nitrogen to weeds (Arif *et al*., 2007) which resulted in better population of weeds.

As FYM level was increased from significant increase in weeds population was observed. It could be attributed to the positive impact of FYM on soil water holding capacity, bulk density and nutrient availability throughout the weeds growing periods. Similar results are reported by Ali *et al*. (2011) who concluded that higher level of FYM application significantly improved weeds density and fresh and dry biomass. In the control plots weeds fresh and dry weeds biomass are lower as compare to remaining organic plots due to lowers availability of nutrients. FYM plots provide favorable environmental for weeds germination and growth through improvement of soil water holding capacity, physical and chemical conditions, and greater availability of plant nutrients (Olesen *et al*., 2009).

Table-1. Days to germination, No. of leaves plant^{-1}, leaf area (cm^2), No. of branches per plant and days to harvesting as affected by different organic fertilizers and weeds.

Organic fertilizers	Days to germination	No. of leaves plant^{-1}	Leaf area (cm^2)	No. of branches plant^{-1}	Days to harvesting
Control	9.33 a	5.33 c	37.00	5 c	52 a
FYM	7.67 c	8.33 b	36.33	6.33 b	47.66 b
PM	6.33 d	10.33 a	45.00	9.33 a	43 c
Compost	8 b	8.66 b	43.33	7.33 b	45 c
LSD	1.28	0.57	Ns	1.52	2.3

Means followed by dissimilar letters are statistically significant.

Table-2. Weeds density m^{-2}, fresh and dry weeds biomass (gm m^{-2}) as affected by different organic fertilizers.

Organic Fertilizers	Weeds density m^{-2}	Fresh weeds biomass (g m^{-2})	Dry weeds biomass (g m^{-2})
Control	156 b	290.00 b	70.00 b
FYM	175 a	336.66 a	86.66 a
PM	146 c	233.33 c	61.66 c
Compost	177 a	348.66 a	85.50 a
LSD	8.23	24.62	8.37

Means followed by dissimilar letters in the respective column are significant.

Weed Flora

Different weeds (%) were found in the field during the course of the experiment which are *Anagallis arvensis* L.*, Phalaris minor* Retz., *Coronopus didymus* L., *Oenothera drumendii* Hook., *Chenopodium album* L. and *Medicago denticulata* Willd.

S. No.	Weed name	% during study
1	*Anagallis arvensis* L.	41
2	*Phalaris minor* Retz.	21
3	*Coronopus didymus* L.	13
4	*Oenothera drumendii* Hook.	12
5	*Chenopodium album* L.	9
6	*Medicago denticulata* Willd	4

CONCLUSION

The use of organic fertilizers (poultry manure) significantly affected all the growth attributes (days to germination, number of leaves, number of branches and harvest time) of Swiss chard and

density, fresh and dry weight (m^{-2}) of weeds. Poultry manure is therefore recommended for the growth of Swiss chard and reducing weeds.

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