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COMPARATIVE MANAGEMENT OF ORGANICALLY SOWN VEGETABLES UNDER TUNNELS AND FIELD CONDITIONS

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ABSTRACT

A field trial was conducted at National Institute of Organic Agriculture (NIOA), NARC, Islamabad, Pakistan during Kharif 2011, which was aimed at managing organically sown vegetables under walk-in tunnels and open field situation. Vegetables i.e. long gourd, bitter gourd, sponge gourd and farash beans under walk-in tunnels and open field. Enriched compost @ 100 kg per acre was used in furrows in the plots in two split doses. The results revealed that long gourd, bitter gourd, sponge gourd and farash beans remained 77.0, 13.6, 18.4 and 39.4 kg under walk in tunnels as compared to the vegetables in open field 54.5, 5.85, 4.55 and 34.9 kg respectively.

Keywords: Organic, off-season summer vegetables, walk-in tunnels, open field, management techniques

INTRODUCTION

Vegetable and crop production in Pakistan is gradually decreasing and the population is expected to rise to 191.7 M by 2015 which is a great challenge. Moreover, another threat of climate change is knocking at the doors (Akbar, 2012). Around 60 % of Pakistan population is facing food insecurity. On the other hand; the nature has blessed Pakistan with diverse weather and land types. During 2010-11, out of total 20.43 M hectare of arable land of Pakistan, the area under vegetable cultivation was 0.41 M hectare while during 2009-10, the area of vegetable was 0.38 M hectare in Pakistan (Statistics division, 2011).

Most of the vegetables are cultivated under conventional farming system where huge quantities of chemical inputs are used annually causing a threatening death toll annually which is a challenge for policy makers, farmers and agriculturalists (Rebecca, 2011). In these circumstances, it is a need of day to collect and use the ancient knowledge of primitive agriculture for the sustainability of safe agro-ecosystem (Usha and Goyal, 2011).

It is a fact that organic agriculture is the only hope for sustainable food production. It concentrates on recycling methods, with low inputs and high output techniques. Gradually enhancing the soil fertility and diversity at all levels is based on integrated system of all components of agriculture. Additions of farmyard manure (FYM) to organic systems have been shown to enrich Soil Organic Matter (SOM) directly and indirectly through improved soil properties such as increased numbers and distribution of soil macroaggregates, microfauna, macro and micro nutrients and improved crop yields (Edmeades, 2003; Jiang *et al*., 2006; Mikha and Rice, 2004). Research on organic production systems, which rely on mechanical weed management and the incorporation of green manures and FYM, have often shown increase in weed seed as a result of viable weed seed return via incorporation of manures and reduced efficacy of mechanical over chemical weed control during the transition (Huxham *et a*l., 2005; Riemens et al 2007). Organic vine vegetables when planted in late summer during rainy season get badly infested with weeds, pests and diseases. These stresses affect productivity of these vegetables. Moreover, early winter conditions limit their growing season short which has negative effects on their yields. However, if managed properly, these vegetables may yield high returns. Use of low walk-in tunnel structure may be cost effective and more beneficial. However, problems associated with this technology include different diseases and pest infestations along with stunted plant growth.

Organic farmers has identified that organic matter as the number one barrier to long term success during the transition to certified production systems, with soil fertility and quality (Walz, 2004). The aggregation of soil is an essential function in soil physicochemical and biological processes, and has been shown to influence soil quality through the protection of existing soil organic matter (SOM), moisture holding capacity and soil nutrient retention (Angers and Caron, 1998; Jiao *et al*., 2006). Organic vegetable production is management–intensive, and requires careful attention to maintain natural balance for crop production. Organic vegetable management starts from healthy seed including soil fertility, weed management, plant protection measures and management of post harvest diseases. It is very important for an organic vegetable grower to consider some important tasks before initiating organic vegetable production like marketing opportunities of organic vegetables, availability of adequate resources, able to ride out possible reduced yields of vegetables and attention to plant protection measures, soil fertility management and record keeping. During transitioning from inorganic to organic vegetable production, where pest and disease pressure is high, conventional pest management tactics can be applied along with organic techniques to reduce pest

and disease pressure (Henry, *et al*, 2010). The objectives of the present studies were to develop management strategies of organic vegetables under low tunnels and open fields and comparison of productivity and profitability of organic vegetables under the same conditions.

MATERIALS AND METHODS

This study was conducted at National Institute of Organic Agriculture (NIOA), NARC; Islamabad, Pakistan during the year 2011.The aim of the study was to develop management strategies of vegetables under low tunnels and open fields besides the comparison between their productivity and profitability under the same conditions. Organic vine vegetables planted in late summer after monsoon rains were transplanted in walk in tunnels and open fields included long gourd (*Lagenaria siceraria*), Bitter gourd (*Momordica charantia*), Sponge gourd (*Luffa cylindrical*) and Farash Bean (*Phaseolus vulgaris*). The seedlings were planted in polythene tubes during the month of July (one month before) in glass house and shifted in the field in August. The plant height at the time of transplanting was recorded. Six feet high walk-in tunnel structures oriented in north to south direction were constructed using bend iron pipes. Area of each tunnel structure was 1344 Sq.ft. Adjacent to each tunnel structure seedlings grown in polythene tubes were shifted in open fields on 2 ridges having plant to plant distance 56 cm and row to row, 240 cm. The equal number of plants (60 plants on each row) in case of long gourd and bitter gourd, 90 plants in case of sponge gourd and 45 plants in case of farash bean were planted. The same number of plants was planted on ridges in open field. A total of 1020 vegetable plants were shifted on 2 kanals of land, situated in citrus garden area, NARC, Islamabad.

Total 300 kg of compost was applied to the experimental field at the time of transplanting the plants. Three manual hoeing were done and the leaf compost was placed near the lower part of the stems. For the control of red pumpkin beetle on the vegetable plants wood ash and organic pesticides were used. The data was recorded Yield was recorded on harvesting basis.

RESULTS AND DISCUSSION

Seed Germination

Data regarding seed germination showed significant difference among the vegetables (Table 1). The largest number of seeds germinated of T3 sponge gourd (590) and it was followed by T1 long gourd (485) while bitter gourd and frash bean seeds germination was 350 and 293 respectively. The growing medium should be placed around the roots of the plants for seed germination (Williams, 2012).

Plant height

The data of plant height also showed significant differences among the vegetables. The height of sponge gourd was observed maximum 50cm and it was followed by long gourd 20cm while the plant height of frash bean and bitter gourd was 18 and 14.1 respectively.

Red Pumpkin Beetle on vine vegetables and its management

Red Pumpkin Beetle (*Aulacophora foveicollis*) attacked vine vegetable whole the year. Bitter gourd seedling is quite safe as their leaves are very bitter. Bottle gourd and cucumbers are badly affected during early stage and in the absence of proper treatment the whole crop is damaged by the red pumpkin beetle within few days.

The data shows that the long gourd and F.Beans were highly preferred (100 %) and (75%) while sponge gourd was least preferred. It is notable that Bitter Gourd remained free from the attack of Beetle (Table 2). Thapa & Neupane (1992) concluded that infestation of red beetle was high on watermelon (6-24 adults per plant).Among ten species of cucurbits tested in seedling stage under free choice condition, bitter gourd seedlings were completely free while muskmelon (80.63 % damage) and long melon (71.69 % damage) were highly preferred and snake gourd (7.63 % damage) and ash gourd (13.88 % damage) seedling were the least preferred. (Incidence, Host Preference and Control of the Red Pumpkin Beetle, *Aulacophora foveicollis* (Lucas) (Coleoptera: Chrysomelidae) on Cucurbits.

The successful control was achieved by dusting wood ash on the affected vegetables (Table 3). The ash got from burning of wood or dry dung is a good control of Red Beetle. In the morning, the effected plants were dusted with ash in a piece of cloth which was stick on the plant leaves early in the morning in the presence of dew drops. This practice was revised after one week and gave good results from the attack of Beetle.

Ninety eight (98) percent control was achieved against Red Pumpkin Beetle on Long gourd and Frash Bean while 100 percent successful was achieved on sponge gourd. Surely, it is the excellent method of treatment which is being done by the farmers in Pakistan from ancient times. Moreover, wood ash protects various delicate vegetable plants from propagation of various harmful Lepidopterean larvae.

Table 1. Data regarding seedling and its transplanting at Organic fields at NARC 2011.

S. No	Name of vegetable	No.of tubes with plants	No.of seeds Germinated	Shifting Month	Germi-nation (%)	Temp. (Av) °C	Seed Germination After days	Plant Height (cm)	No. of branches
1	Long Gourd	500	485	August	97	35	8	20	0
2	Bitter gourd	400	350	August	87.5	35	10	14	2
3	Sponge gourd	600	590	August	98	35	6	50	3
4	Farash bean	300	293	August	98	35	6	18	2

Table 2. Attack of Red Pumpkin Beetle on vine vegetables showing intensity.

S. No	Name of Vegetable	Month of Attack	Intensity (%)	Pest per plant	% age of infestation	Damaged area of plant
1	Long gourd	August	100	5-9 adults	40	New leaves
2	Bitter gourd	August	0	0	0	0
3	Sponge gourd	August	6	0-1	15	New buds
4	Farashbean	August	75	2-3	27	Old and new leaves

Table 3. Data regarding management of Red pumpkin Beetle on vine vegetable.

S.No.	Name of Vegetable	Quantity of ash /plant (g)	Age of the plant (days)	No. of Application done	Control (%)	Mode of action of wood ash observed
1	Long Gourd	3-7	40	2	98	Repellent
2	Bitter gourd	0	40	0	0	NA
3	Sponge gourd	3-5	40	2	100	Repellent
4	F.Bean	3-7	40	2	98	Repellent

Table 4. Harvesting and Production (Marketable).

Vegetable	Vegetable harvesting time	Tunnel				Flat				Difference (Rs)
		pickings	Qty (kg)	Damaged (kg)	Amnt (Rs)	pickings	Qty	Damaged (kg)	Amount (Rs)	
L.gourd	29.09- 13.12	19	77.0	6.0	2130	15	54.5	3	1545	585.0
B.gourd	7.10-14.11	6	13.6	5.5	1215	5	5.85	0.600	78.75	1136.25
S.gourd	29.09-18.11	12	18.4	2.2	276	7	4.55	1.500	53.25	222.75
F.bean	07.10-12.12	11	39.4	0.8	1576	7	34.9	0.500	1376	200

The longest harvesting time remained the month of December in long gourd and Farash bean whereas remaining vegetables were ended by the mid of November. Total long gourd production was 83 kg and marketable production was 77 kg as compared to open field at 57.5 kg during 15 pickings (Table 4). While production of Bitter gourd remained 19.1 kg during 6 pickings in tunnel structures while it gave only 06.45 kg production in flat sowing. The growing speed of bitter gourd plants remained very slow and it was badly damaged due to the attack of fruit fly. The production of farash bean was 40.2 kg under tunnel structure during 11 pickings and the production in flat sowing was 35.1 kg (Table 4). Among (Condron *et al.,* 2000 and Munro *et al.,* 2002) described that organic farms typically have lower levels of most available plant macronutrients, especially inorganic nitrogen. The tendency of people towards consumption of organic vegetables is not very satisfying and encouraging as most of the community is unaware of the health benefits. Most of the people insist to keep the prices of organic vegetables at current market price.

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