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Effect of Organic and Inorganic Nutrients on Growth and Yield of Pumpkin (*Cucurbita maxima*) under Moringa based Agro forestry System

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Abstract

An experimental was conducted during summer season of 2019 to study the effect of nutrients level on growth and yield of Pumpkin (*Cucurbita maxima*) under Moringa (Sahjan) based Agroforestry system. The experiments were laid out in the Randomized Block Design (RBD) with three replications and 13 treatments to assess the effect of organic and inorganic sources of nutrients on Pumpkin. The results showed that treatment T_5 i.e. application of 50% dose of NPK + 50% Vermicompost was found to be the best treatment over other for growth, yield (699 q ha-1) and BC ratio (1:2.97)., followed by T_8 i.e. application of 25% NPK + 75% Vermicompost with yield of 621q.ha-1 and the lowest was that of T_0 (Control) i.e. 100% NPK with yield of 209 q.ha-1.

Keywords: Agroforestry, Pumpkin, FYM, Vermicompost, growth and yield *etc.*

Introduction

Agroforestry is a farming system that integrates crops and/or livestock with trees and shrubs. The resulting biological interactions provide multiple benefits, including diversified income sources, increased biological production, better water quality, and improved habitat for both humans and wildlife (Khanal, 2011). Agroforestry practices can reduce atmospheric concentration of CO_2 by increasing carbon storage in biomass, decreasing emission at source and by modifying agricultural practices to increase the quantity of carbon stored in soil organic matter (Puri and Panwar, 2007). Further, in context with the Kyoto protocol, the Clean Development Mechanism (CDM) has been created, that allows developing countries to obtain tradable Certified Emission Rights (CER) for measures capable to generate real, measurable and long-term benefits related to the mitigation of climate change (Kyoto Protocol). Viability of agroforestry schemes for CDM has been economically evaluated in many case studies yielding different results and recommendations. May and Veiga (2007) calculated cash flow and return on investment over >20 years for different smallholder agroforestry systems in Mato Grosso, Brazil, with participation by small and medium rural producers and their local associations. Results were favorable, even without CDM and improved significantly through CDM funds. Thus, agroforestry systems can be superior to other land uses at the farm, watershed, regional and global scale, because they optimize tradeoffs between increased food production, poverty alleviation, and environmental conservation (Izac and Sanchez, 2000). The 'Practice of agroforestry' or planting trees on agriculture land can protect forest by making tree products such as firewood and fodder easily available to farmers, can restore fertility of land by decreasing soil erosion, adding nutrients through decomposition of leaf litter and nitrogen fixation, recycling leached-down nutrients and helping breakdown of nutrients in the subsoil by means of deep roots. Problems such as shortage of forest resources have been reduced by the mid hill farmers through retaining or keeping trees in various parts of their farmland along with crops for centuries despite having limited landholding (Shrestha, 1995). Although, Agroforestry practice is a newly evolved technology among technicians and extensionists, its many forms have been instrumental in sustaining farming system of the region for

centuries. Such ecological understanding developed by one farming community may be relevant to address the constraints encountered by other communities and so, investigating local knowledge may be a powerful, efficient and rapid means of filling the gaps in scientific understanding of agroforestry (Walker *et al.*, 1995).

Pumpkin is an important cucurbitaceous vegetable grown throughout India and other warmer regions of the globe. In India, it is mainly grown in Assam, West Bangal, Tamil Nadu, Karnataka, Madhya Pradesh, Uttar Pradesh, Orissa, Kerala and Bihar. Because of its high carotene content and good keeping quality, it is considered as a vegetable of immense value. Pumpkin is placed as high value vegetable owing to its high productivity, low cost of production, high nutritive value, good storability, long period of availability, better transport qualities and excellent response to forcing and extensive cultivation both in tropical and subtropical parts of our country. Pumpkin is also known as 'Kasiphal', 'Sitaphal', 'Lalkaddu' in Hindi.

Moringa

Moringa oleifera Lam commonly known by various name like drumstick, moringa, sahajan belongs to family Moringaceae. The name of tree varied according to its vicinity in varied province of country. Moringa is a wonder tree with its great medicinal, industrial, food, fodder, and fuel values for both human and their livestock. The origin of tree has to be believed in sub-Himalayan tracts of India, Pakistan, Bangladesh and Afghanistan (Mulugeta *et al.,* 2014). The drought resistant, easy acquiescently in all type of soil and climate, makes it highly suitable in all parts of the world especially in semi-arid tropics. Moringa naturally found in tropical and sub-tropical forest of India or grow by farmers on bund of agricultural land. India has first rank in case of area and production of moringa. Among the Indian states, southern parts of country contribute much more in production of moringa. It is a suitable tree for traditional agroforestry in the home because of its versatility (Odee *et al.,* 2001; Palada and Chang, 2003; Nduwayezu *et al.,* 2007) with respect to agroforestry practices moringa grown in home gardens in between of agricultural crop/intercrop and on the boundaries of agricultural fields. The tree and its products are highly versatile in nature. The tree fulfills allthe basic needs of human like food, health (medicinal properties) and wealth (by selling of its products). It is said to have known immune boosting ability and Eyzaguirre, 2007). Every parts of tree has used in (FAO, 1988; Ncube, 2006; Smith rious manner by the human being. The very most utilizable parts of tree are green pod, tender leaves, flowers and seed for food purpose. With Moringa tree parts, retaining high percentages of vital nutrients throughout the year (Melesse *et al.,* 2012). The leaves of moringa are rich source of many nutrients, vitamins and protein. Most of the products of tree are consumed by the local people itself and remaining are sold in market. The local people used the leaves and flower of moringa for vegetable purpose. They prepare a local dish called "Bhujiya" by boiling the leaves and flower of tree. The green pods are eaten in the form of various dishes like curry, soup and sambar (south Indian dish). The leaves and tender parts of tree also used as a fodder purpose. The wood produce from it are soft in nature so it is used as a fuel wood and sometime used for construction of local structures like hut, shed etc. The seed oil of moringa is edible used for cooking purpose by the local healers. Moringa seed can also be used as a water purifier both for the urban and rural inhabitants (Ali *et al.,* 2010). During the water purifying process, seeds of moringa are tag in a piece of cloths and put in a pot where water are stored, seeds absorbed impurities and sink in to bottom of pot. Beside these direct uses the tree also have several indirect uses, it enhance the fertility of soil because each parts of tree are nutrient rich. Pod shucks and seed kernel press cake can be used as mulch and enhances soil fertility when they decompose (Prat *et al.,* 2002). The tree are grow between crops or around the crop boost the production/productivity of crop through adding so much nutrient to agricultural field. The less lignin and chitin content in the detritus matters of tree parts make it easily decomposable, fully decomposed organic matter provide essential nutrient for growth and development of a plant Intercrops of Moringa have led to a realization of high yields in horticultural crops and its organic fertilizer has been found to be more efficient in plant growth enhancement than organic matter from other plant compost (Prat *et al.,* 2002; Emmanuel *et al.,* 2011). Instead of that much benefits received from this tree, are less popularized in the field of agroforestry. The present study focused the agroforestry potential of tree, its benefits to society and the technique which can make it more suitable as a one of the agroforestry component.

The tree *Moringa oleifera* open new dimension in field of agroforestry due its easily established, fast growing/ short rotation habit, diversify nature of its products, multiple benefits to

people and their livestock and several other direct and indirect benefit to societies across the world. The trees are planted between the crops or on the bund by the farmers. The yield of crop increase in the field where moringa integrated with agricultural crop because it is rich source of nutrient and withdraw the subsurface nutrient from the soil through its deep root system. Many earlier study across the world show that the growth and yield of agricultural or horticulture crop increase when this tree incorporate in field (Anjorin *et al.,* 2010; Phiri and Mbewe, 2010; Ali *et al.,* 2011; Yasmeen *et al.,* 2013) crops such as wheat (Yasmeen *et al.,* 2012 and 2013). Other than positive effect on agriculture crops, the tree has source of income to poor or small scale farmers in country.

Materials and Methods

This experiment was carried out during kharif 2018 at Crop Research Farm, Department of Agroforestry, SHUATS, Prayagraj, UP, which is located at 25.28oN latitude, 81.54oE longitude and 98 m altitude above the mean sea level. This area situated on the right side of the river Yamuna by the side of Prayagraj Rewa Road about 5 km away from Prayagraj, city. The climate of this region is typically sub-tropical and semi-arid with monsoon commencing by the third week of June and with drawing by end of September. The temperature reached up to 48oC and in winter it goes down to as low as 2-3oC. During the summer hot scorching winds known as "Loo" and frost during winter months are common features. Experimental mechanical analysis of the soil was sand 59.50 (%), silt 24.10 (%), clay 16.40 (%) and textural class silt loam, while chemical analysis of soil was available nitrogen (242 kg/ ha), available phosphorus (24.50 kg/ ha), available potassium (95.00 kg/ ha), organic carbon (0.40 %), pH (7.50) and EC (0.19 dS/ m). Treatment comprises of T_0 -Control (100%NPK), T_1 -75 % NPK + 25% FYM, T_2 -75% NPK + 25% Vermicompost, T_3 -75% NPK + 25% Poultry Manure, T_4 -50%NPK + 50% FYM, T_5 -50%NPK + 50% Vermicompost, T_6 -50%NPK + 50% Poultry Manure, T_7 -25%NPK + 75%FYM, T_8 -25%NPK + 75%Vernicompost, T_9 -25%NPK + 75%Poultry Manure, T_{10} -100% FYM , T_{11} -100%Vermicompost and T_{12} -100% Poultry Manure. Data on various parameters viz were recorded and analyses statistically to see the level of significance of various treatments.

Results and discussion

The data presented in table 1 showed that the maximum vine length (5.55 m) was recorded with T_5 [50%NPK + 50% Vermicompost] followed by 5.29m with T_8 [25%NPK + 75%Vernicompost] and the minimum was recorded (3.73m) in T_0 Control (100%NPK). Treatments T_1, T_2, T_3, T_8, T_{10}, T_{11} and T_{12} were statistically at par with T_5. Whereas the number of branches the maximum (10.70) was recorded with T_5 [50%NPK + 50% Vermicompost] followed by 10.20 with T_8 [25%NPK + 75%Vernicompost] and the minimum was recorded (4.50) in T_0 Control (100%NPK). Treatments T_1, T_2, and T_8 were statistically at par with T_5. In case of days to first flowering indicated that the treatment T5 [50%NPK + 50% Vermicompost] was recorded minimum days to first male flowerings (46.60), followed by (47.90) with T_8 [25%NPK + 75%Vernicompost], T_0 (100%NPK) recorded the maximum (50.60). The maximum number fruits/vine (3.40), followed by (2.70) with T_8 [25%NPK + 75%Vernicompost], T_0 (100%NPK) recorded the minimum (1.30). However, treatments T_2 and T_8 were statistically at par with T_5. A perusal of data indicated that the treatment T_5 [50%NPK + 50% Vermicompost] was recorded maximum fruit length (22.52), followed by (21.01) with T_8 [25%NPK + 75%Vernicompost], T_0 (100%NPK) recorded the minimum (17.68). However, treatments T_2 and T_8 were statistically at par with T_5. The treatment T_5 [50%NPK + 50% Vermicompost] was recorded maximum Average fruit weight (4.04), followed by (3.76) with T_8 [25%NPK + 75%Vernicompost], T_0 (100%NPK) recorded the minimum (1.99). However, treatments T_2, T_3, T_8, T_9, and T_{11} were statistically at par with T_5. The maximum Fruit width (23.34), followed by (23.18) with T_8 [25%NPK + 75%Vernicompost], T_0 (100%NPK) recorded the minimum (16.92). However, treatments T_2 and T_8 were statistically at par with T_5. The treatment T_5 [50%NPK + 50% Vermicompost] was recorded maximum Fruit yield/vine (6.19), followed by (6.21) with T_8 [25%NPK + 75%Vernicompost], T_0 (100%NPK) recorded the minimum (2.09). However, treatments T_2, T_3, T_7, T_8, and T_{10} were statistically at par with T_5. However the treatment T_5 [50%NPK + 50% Vermicompost] was recorded maximum Fruit yield (619 q), followed by (621q) with T_8 [25%NPK + 75%Vernicompost], T_0 (100%NPK) recorded the minimum (209q). However, treatments T_8 were statistically at par with T_5.

Table 1: Effect of organic and inorganic source of fertilizers on pre and post-harvest of pumpkin (*Cucurbita maxima*) under moringa based Agroforestry System

Treatments	vine length (m)	Number of branches	Days to first male flowerings	Number of fruits/vine	Fruit Length (cm)	Fruit width (cm)	Average fruit weight (kg)	Fruit yield/vine (kg)	Fruit yield/ha (q/ha)
T_0	3.73	4.5	50.6	1.3	17.68	16.92	1.99	2.09	209
T_1	4.68	8.9	48.1	2.5	17.96	19.59	2.26	3.17	317
T_2	5.26	9.1	48	2.6	20.75	22.85	3.6	5.67	567
T_3	4.79	7.2	49.2	2.3	16.76	18.27	3.17	5.29	529
T_4	4.32	8.4	50.41	2.1	18.15	18.47	2.85	3.99	399
T_5	5.55	10.7	46.6	3.4	22.52	23.34	4.04	6.19	699
T_6	4.1	5.3	48.9	1.9	13.34	19.11	2.15	3.46	346
T_7	4.48	8.5	48	2.1	16.67	16.47	2.87	5.9	590
T_8	5.29	10.2	47.9	2.7	21.01	23.18	3.76	6.21	621
T_9	4.33	5.4	49.3	2.3	13.78	19.31	3.57	2.97	297
T_{10}	4.87	8.2	49.9	2.4	17.91	19.05	2.65	5.15	515
T_{11}	4.88	7	49	2	13.72	20.23	3.19	4.39	439
T_{12}	4.65	8.6	49.7	1.9	17.97	16.94	1.95	3.25	325
F- test	S	S	NS	S	S	S	S	S	S
S. Ed. (±)	0.475	0.98	1.916	0.41	0.997	0.69	0.467	0.567	7.321
C. D. (P = 0.05)	0.981	2.023	3.955	0.847	2.057	1.424	0.965	1.171	15.111

Conclusion

On the basis of the results attempted from present investigation concluded that treatment T_5 i.e. application of 50%NPK + 50% Vermicompost was found to be the best treatment for growth, yield (699 q ha^{-1}) and higher BC ratio (1:2.97). However these results are based on one year of experimentation; hence need validation through further experimentation before formulating recommendation.

REFERENCE

Ali Mohd. (2008). Effect of organic production on growyh, yield, shelf life and juice quality of Tomato (*Lycopersicon esculentum* Mill.). Ph.D (Agri.) Thesis, Submitted to Mahatma Phule Agricultural University, Rahuri.

Ali Z, Basra SMA, Munir H, Mahmood A, Yousaf S. (2011). Mitigation of drought stress in maize by natural and synthetic growth promoters. Journal of Agriculture, Forestry and the Social Sciences 7, 56- 62.

Anjorin TS, Ikokoh P, Okolo S. (2010). Mineral composition of Moringa oleifera leaves, pods and seeds from two regions in Abuja, Nigeria. International Journal of Agricultural and Biological Engineering 12, 431-434.

Anonymous, (2012). Crop wise area and production of horticultural crops in Karnataka, http:// www.horticulture.kar.nic.in.

Anonymous, (2014). Indian horticulture database NHB, Haryana, http:www.nhb.gov.in.

Bankar, S.P.; Indi, D.V. and Gud, M.A. (2009). Effect of VAM fungi and azospirillum on growth and development of kagzilime (Citrus aurantifolia L.) Seedlings. J. Maharashtra Agric. Univ. 34(2): 183-185.

Emmanuel, S.A., Emmanuel, B.S., Zaku, S.G. and Thomas, S.A. (2011). Biodiversity and agricultural productivity enhancement in Nigeria: application of processed Moringa oleifera seeds for improved organic farming Agric. Biol. J. North America. 2 (5): 867-871.

FAO. 1988. Non timber uses of selected arid zone trees and shrubs. FAO Conservation Guide 19. FAO. Rome. pp. 92-101

Ncube, D. (2006). Moringa programmes in Binga District: 10 years of experience. Binga Trees Trust. Binga. pp. 1-4.

Ghosh, S.N. and Besra, K.C. (1997). Growth, yield and physicochemical properties of sweet orange cv. Mosambi grown in response to

organic and inorganic fertilizers under rainfed laterite soils. Proc. National Symp. Citriculture, Nov. 17-19, NRC for citrus, Nagpur, pp. 180-182.

Ghosh, S. P. (2000). Nutrient management in fruit crops. Fertilizer news 45: 71-76.

Izac, A.M. and Sanchez, P.A. (2000). Towards a natural resource management paradigm for international agriculture: the example of agroforestry research. Agricultural Systems, 69 (1): 5-25

May, P.H. and Veiga, F.C. (2007). Financial and technical viability of agroforestry systems for carbon sequestration in small farm areas in Northwest Mato Grosso, Brazil. Presentation 1st Agroforestry World Congress, Florida, USA.

Melesse, A., Steingass, H., Boguhn, J., Schollenberger, M. and Rodehutscord, M. (2012). Effects of elevation and season on nutrient composition of leaves and green pods of Moringa stenopetala and Moringa oleifera. Agroforestry Systems. 86: 505-518

Nduwayezu, J.B., Chamshama, S.A.O., Mugasha, A.G., Ngaga, Y.N., Khonga, E.B. and Chabo R.G. (2007). Comparison in seed kennel sizes and early growth performance of different Moringa oleifera provenances in Southeast Botswana. Discov. Innov. 19: 52-58.

Odee, D.W., Muluvi, G.M., Machua, J., Olson, M.E. and Changwony, M. (2001). Domestication of Moringa Species in Kenya, Development potential for Moringa products. Workshop proceedings October 29th – November 2nd. 2001. Dar es Salaam. Tanzania.www.moringanews.org/actes/ode e_en.doc

Palada, M.C. and Chang, L.C. (2003). Suggested cultural practices for Moringa. AVRDC. 545: 1-5.

Phiri C, Mbewe DN. (2010). Influence of Moringa oleifera leaf extracts on germination and seedling survival of three common legumes. International Journal of Agricultural and Biological Engineering 12, 315-317.

Prat, J.H., Henry, E.M.T., Mbeza, H.F., Mlaka, E. and Satali, L.B. (2002). Malawi Agroforestry Extension Project Marketing and Enterprise Project Report. Agroforestry Publication No. 47. pp. 53-62

Pratt, S. G. and Matthews, K., (2003). Super food Rx:fourteen foods that will change your life, Harper Collins, New York, pp: 353.

Puri, S. and Panwar, P. (2007). Agroforestry Systems and Practices. New India Publishing Agency, New Delhi

Seshadri, V. S. and Parthasarthy, V. A., (2002). Cucurbits, Vegetable crops, Vol I, Third revised edition, Ed. Bose, T. K., Kabir, J., Maity, T. K., Parthasarathy, V. A. SSSand Som, M. G., NayaPrakash Publication, Calcutta, pp. 502-503

Shrestha, R. K. (1995). Indigenous Agroforestry Systems in the Western Hills of Nepal, Proceeding of the Fifth National Workshop on Agroforestry and Fodder Trees, FRSC Occaisional Paper 1/94, Forest Research and Survey Center, Kathmandu.

Soorianathasundaram, K.; Kumar, R. K. and Shanthi, H. (2000). Influence of organic nutrition on the productivity of banana cv. Nendran. South Indian Hort. 45:109-114.

Walker, D.H., Sinclair, F.L. and Thapa, B. (1995). Incorporation of Indigenous Knowledge and Prospective in Agroforestry Development Part 1: Review of Methods and Their Applications, Agroforestry Systems.

Yasmeen A, Basra SMA, Farooq M, Rehman H, Hussain N, Athar HR. (2013). Exogenous application of moringa leaf extract modulates the antioxidant enzyme system to improve wheat performance under saline conditions. Plant Growth Regul 69, 225-233.

Yasmeen AY, Basra SMA, Wahid A. (2012). Performance of late sown wheat in response to foliar application of Moringa oleifera Lam. leaf extract. Chilean Journal of Agricultural Research 72, 92-97.

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