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Growth and Yield of Two Okra (*Abelmoschus Esculentus* L. Moench) Varieties to Combined Fertilizer of Poultry Manure and Urea.

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Abstract
A pot experiment was carried out to determine the effect of organo-mineral fertilizer on the growth and yield response of two varieties of okra at the Teaching and Research Experimental plot of Department of Agricultural Technology, Federal College of Forestry, Ibadan, Oyo State in 2019 rainy season. Organo-mineral fertilizer were applied at the combinations of 75kgN+2.5P.M.t/ha , 75kgN+5.0P.M.t/ha, 75kgN+7.5P.M.t/ha, 75kgN+10.0P.M.t/ha, 75kgN+12.5P.M.t/ha and 0 (control) t/ha were applied on two varieties of okra (LD-88 and Clemson Spineless variety seed). The experiment was 2 x 6 x 4 factorial experiment arranged in randomized complete block design (RCDB). Data were collected on the number of leaves, plant height, stem girth, days to first harvest, number of fruits/plant and fresh harvest weight. The result shows ***Growth and yield of the 2 varieties of okra was significantly affected with the application of urea fertilizer in combination with poultry manure (PM).*** *The average number of fruits per plant, there were significant differences among the application rates of organomineral fertilizer with 75kgN+12.5t/haPM application on LD-88 having the highest number of fruits at 12.28. The application of 75kgN+12.5t/haPM also produced the highest mean fresh fruit yield in LD-88 (169.67g) and Clemson Spineless (168.67g), while the least mean fruit weight was recorded in the 0 t/ha application on both okra varieties having 139.00g (Clemson spineless) and 142.50g (LD-88) each respectively, and significantly different from other application rates. From the results, combined application of the two fertilizers type will reduce the farmer's budget for crop fertilization and inclusion of organic fertilizer in the combination will surely ensure production of crop under a less polluted environment. The promising yield obtained with organomineral fertilizer application on okra is a pointer to its potential use as nutrient supply in enhancing its production in Nigeria.*

Keywords: Okra, growth, yield, poultry manure, urea, organo-mineral, application.

INTRODUCTION

Okra (*Abelmoschus esculentus* L. Moench) is an annual, herbaceous flowering plant in the Mallow family that originated from tropical and subtropical Africa and is

natural to the West Africa (Aladele *et al*., 2008). Okra is an important vegetable crop in Nigeria and it is widely cultivated throughout the tropics. It is found in almost all markets in Africa (Schippers, 2000). It is a good source of vitamin A, B, C and also rich in protein, carbohydrates, fats, minerals, iron and iodine (Baloch *et al*., 1990). Nutritionally therefore, the production of fruit vegetable like okra will help in alleviating the nutritional need and food security of Nigerians. Despite its nutritional value, its optimum yield in the tropical countries is low partly because of continuous decline in soil fertility from the intensive cultivation of available land with little or no fertility management. Improving soil fertility through fertilizer application has become a major factor that has enabled to meet the food demand to feed billions of people.

Organomineral fertilizers are being developed from farm and city wastes, which may be fortified with inorganic nitrogen or nitrogen-phosphorus fertilizers. Organomineral fertilizer is a low input technology organic fertilizer which is used for improving the nutrient status of tropical soils for sustainable crop production as it combines the good attributes of both sources to enhance yield of crops (Egbuchua and Enujeke, 2013). Hence, this study aims at determining the effects of organomineral fertilizer application of the combination of poultry manure and urea fertilizer on the growth and yield of two okra varieties.

MATERIALS AND METHODS

Experimental Location

The pot experiment was carried out at the Teaching and Research Experimental plot of Department of Agricultural Technology, Federal College of Forestry, Ibadan, Oyo State in 2019 rainy season.

Experimental Procedure

Two varieties of okra (LD-88 and Clemson Spineless variety seeds) where treated with organo-mineral fertilizer applications that is a combination of air dried poultry manure and urea fertilizer. The Organo-mineral fertilizer were applied at the combinations of 75kgN + 2.5 P.M. t/ha , 75kg N +5 P.M. t/ha, 75kg N + 7.5 P.M. t/ha, 75kg N + 10.0 P.M. t/ha), 75kg N + 12.5 P.M. t/ha and 0 (control) t/ha in a 5.0kg soil capacity plastic pots. The experiment was 2x6 factorial experiment arranged in randomized complete block design (RCDB) replicated four times. Okra seeds were procured at National Institute of Horticultural Research (NIHORT) Ibadan, Oyo State, Nigeria. Organomineral fertilizer was made by air drying the collected poultry manure from the Poultry Farm of Federal College of Forestry, Ibadan, Oyo State and Urea fertilizer was acquired from Agricultural Inputs shop at Gbagi, Dugbe, Ibadan market. Application was done 2 weeks before planting. Seeds were sown at two seeds per hole and later thinned to one plant per pot after eight days of planting. Necessary cultural practices such as watering, weeding and pesticides application were also carried out.

Pre-planting soil analysis

Prior to cropping, soil samples (0 to 20cm depth) were collected for chemical and physical analysis.The top soil samples were randomly collected with auger, bulked and sieved through 2 mm mesh. Soil pH was determined in 1:2 water ratios with pH meter. Organic matter was analyzed by normal Walkely Black Dichromate Method, Nitrogen by micro-kjedahl method, available P was extracted with Bray-1 method (Bray and Kurtz, 1945) and the phosphorus in the extract was determined spectrometrically. Exchangeable potassium (K), calcium (Ca), sodium (Na) and magnessium (Mg)

were extracted with 0.1 N ammonium acetate. Potassium (K) and Na were read with flame photometer, while Ca and Mg were determined using absorption Atomic Spectrophotometer (AAS). Micronutrients (Fe, Cu, Zn and Mn) were extracted with HCl and read on AAS.

Data measurement and Statistical Analysis

Data were collected on number of leaves, plant height and stem girth at 4, 6, 8 and 10 weeks after planting, days to first harvest, number of fruits/plant and fresh fruit weight. All the data collected was subjected to the analysis of variance, using statistical package DSAASTAT ver. 1.101 (Onofri, 2011), and treatment means separated using Duncan multiple range test (DMRT) at 5% level of probability.

Soil and organomineral nutrient analysis

The result of the analysis of the physical and chemical properties of the soil and organomineral fertilizer is presented in Table 1. The result showed that the soil had a pH of 6.0 which is slightly acidic with organic matter content of 0.87%, nitrogen (0.10%), phosphorus (4.22 mg/kg) and potassium (0.48 cmol/kg). The analysis of the poultry manure used for the study revealed that it has a pH of 5.97 (slightly acidic) contained Organic Carbon 12.7%, organic matter content of 23.00%, Total nitrogen (2.15%), phosphorus (10.30 mg/kg) and potassium (1.78 cmol/kg). The analysis of the poultry manure used for the study revealed that it has a pH of 5.97 (slightly acidic) contained Organic Carbon 12.7%, organic matter content of 23.00%, Total nitrogen (2.15%), phosphorus (10.30 mg/kg) and potassium (1.78 cmol/kg).

RESULTS

Table1: Pre-planting chemical and physical properties of the soil and Poultry manure used in the study.

Parameters	Soil	Poultry Manure
pH (in H2O)	6.0	5.97
Organic Carbon (%)	0.87	12.70
Organic Matter		23.00
Total Nitrogen (%)	0.10	2.15
Phosphorus (mg/kg)	4.22	10.30
Calcium (Cmol/kg)	5.20	3.19
Magnesium (Cmol/kg)	1.45	4.85
Sodium (Cmol/kg)	0.96	1.04
Potassium (Cmol/kg)	0.48	1.78
Copper (mg/kg)	3.25	0.05
Manganese (mg/kg)	198.00	289
Zinc (mg/kg)	5.80	22
Iron (mg/kg)	13.05	104
Sand (%)	83.40	
Clay (%)	8.60	
Silt (%)	8.00	

Growth and yield parameters of okra

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Growth and yield of the 2 varieties of okra was significantly affected with the application of urea fertilizer in combination with poultry manure (PM) as shown in Tables 2, 3, 4 and 5. The varying application level of poultry manure (PM) in combination with urea (organomineral fertilizer (OMF)) on the varieties of okra has significant effect on stem girth, number of leaves and fresh fruit weight of the two varieties. There is no significant effect on the plant height as shown in Table 2. In the stem girth, there is significant effect of the application of organo-mineral fertilizer as the least mean stem girth at 10 weeks after planting (WAP) was recorded in the 0 t/ha application in both varieties of okra having 0.49 and 0.40 mm in LD-88 and Clemson Spineless, respectively. The highest mean stem girth was recorded in LD-88 having 0.79 mm at the application of 7.5, 10 and 12.5 t/ha combined with 75kgN/ha and is not significantly different from the application on Clemson spineless variety. There is no significant difference in the application of organomineral fertilizer in the plant height of the two varieties of okra. At 10 WAP, control application on LD-88 had the least mean plant height of 30.00 cm, while the highest mean plant height was recorded in LD88 having 41.76cm with the application of 75kgN/ha+5.0t/ha PM. There is significant effect of the organomineral fertilizer application on the number of leaves production at 6, 8 and 10 WAP. The application of 75kgN/ha+10.0t/haPM had the highest mean number of leaves of 10.71 in the okra variety LD-88 and which is not significantly different from the 75kgN/ha+7.5t/haPM application. The least mean number of leaves was observed in the 0 t/ha application in both varieties of okra. In the yield parameters assessed the application of 10.0 and 12.5t/haPM combined with 75kgN/ha brought about earlier days to harvesting in both varieties of okra that ranged from 76.05 days to 77.95 days. However the control application produced very late harvesting and were significantly different from the okra varieties that received the application treatment of urea fertilizer and poultry manure combination. The average number of fruits per plant, there were significant differences among the application rates of organomineral fertilizer with 75kgN+12.5t/haPM application on LD-88 having the highest number of fruits at 12.28. The application of 75kgN+12.5t/haPM also produced the highest mean fresh fruit yield in LD-88 (169.67g) and Clemson Spineless (168.67g), while the least mean fruit weight was recorded in the 0 t/ha application on both okra varieties having 139.00g (Clemson spineless) and 142.50g (LD-88) each respectively, and significantly different from other application rates.

Table 2: Effects of organomineral fertilizer application rate on okra variety stem girth at 4, 6, 8 and 10 WAP

VARIETY	APPLICATION RATE	4WAP	6WAP	8WAP	10WAP
LD 88	0	0.26c	0.29c	0.43bc	0.49cd
	75 Kg/ha N + 2.5 t/ha PM	0.57ab	0.50a	0.59ab	0.69ab
	75 Kg/ha N + 5.0 t/ha PM	0.63a	0.48ab	0.68a	0.77a
	75 Kg/ha N + 7.5 t/ha PM	0.59ab	0.51a	0.69a	0.79a
	75 Kg/ha N + 10.0 t/ha PM	0.56ab	0.50a	0.69a	0.79a
	75 Kg/ha N + 12.5 t/ha PM	0.59ab	0.51a	0.69a	0.79a
Clem	0	0.25c	0.32bc	0.46bc	0.40d

	75 Kg/ha N + 2.5 t/ha PM	0.32bc	0.31bc	0.38c	0.57bc
	75 Kg/ha N + 5.0 t/ha PM	0.34bc	0.30c	0.59ab	0.64abc
	75 Kg/ha N + 7.5 t/ha PM	0.49ab	0.45abc	0.69a	0.74a
	75 Kg/ha N + 10.0 t/ha PM	0.33bc	0.46abc	0.69ab	0.75a
	75 Kg/ha N + 12.5 t/ha PM	0.59ab	0.46abc	0.64a	0.77a

*Means with the same letter in the same column are not significantly different at 5% using Duncan multiple range test; WAP = weeks after planting.

Table 3: Effects of organomineral fertilizer application rate on okra variety plant height at 4, 6, 8 and 10 WAP.

VARIETY	APPLICATION RATE	4WAP	6WAP	8WAP	10WAP
LD 88	0	13.20	19.34	29.67	30.00
	75 Kg/ha N + 2.5 t/ha PM2.5	15.45	25.25	34.00	40.68
	75 Kg/ha N + 5.0 t/ha PM5	15.13	28.09	39.30	41.76
	75 Kg/ha N + 7.5 t/ha PM	14.83	25.33	39.00	38.05
	75 Kg/ha N + 10.0 t/ha PM	13.21	24.45	39.50	34.84
	75 Kg/ha N + 12.5 t/ha PM	12.95	22.98	38.00	35.67
Clem	0	12.83	22.05	30.34	31.43
	75 Kg/ha N + 2.5 t/ha PM2.5	14.28	24.38	35.50	36.10
	75 Kg/ha N + 5.0 t/ha PM5	15.10	25.60	33.76	34.34
	75 Kg/ha N + 7.5 t/ha PM	15.08	27.60	32.17	35.83
	75 Kg/ha N + 10.0 t/ha PM	13.91	26.00	34.11	36.43
	75 Kg/ha N + 12.5 t/ha PM	11.90	25.39	35.20	36.50

*Means with the same letter in the same column are not significantly different at 5% using Duncan multiple range test; WAP = weeks after planting.

Table 4: Effects of organomineral fertilizer application rate on okra variety number of leaves at 4, 6, 8 and 10 WAP.

VARIETY	APPLICATION RATE	4WAP	6WAP	8WAP	10WAP
LD 88	0	5	5.67cde	5.84d	6.38c
	75 Kg/ha N + 2.5 t/ha PM	4.83	6.33bcde	6.50bcd	7.88b
	75 Kg/ha N + 5.0 t/ha PM	5.50	6.50bcd	7.67ab	8.54b
	75 Kg/ha N + 7.5 t/ha PM	5.17	7.68a	8.34a	10.23a
	75 Kg/ha N + 10.5 t/ha PM	5.34	7.10ab	8.00a	10.71a
	75 Kg/ha N + 12.5 t/ha PM	5.4	6.17bcde	7.34abc	7.54b
Clem	0	4.67	5.67cde	6.34bcd	6.08c
	75 Kg/ha N + 2.5 t/ha PM	5.34	5.34e	6.00cd	6.73b
	75 Kg/ha N + 5.0 t/ha PM	5.17	6.65bc	7.17abcd	8.04b
	75 Kg/ha N + 7.5 t/ha PM	5.17	6.18bcde	7.00abcd	8.38b
	75 Kg/ha N + 10.0 t/ha PM	4.48	6.19bcde	6.34bcd	7.87b
	75 Kg/ha N + 12.5 t/ha PM	4.83	5.60de	7.17abcd	8.04b

*Means with the same letter in the same column are not significantly different at 5% using Duncan multiple range test; WAP = weeks after planting.

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Table 5: Effects of organomineral fertilizer application rate on okra variety days to first harvest, number of fruits/plant and fresh fruit weight

VARIETY	APPLICATION RATE	Number of fruits/plant	Days to first harvest	Fruit yield/plot
LD 88	0	7.76f	85.57d	142.50f
	75 Kg/ha N + 2.5 t/ha PM	8.11e	80.10bc	154.00d
	75 Kg/ha N + 5.0 t/ha PM	8.65de	80.00bc	157.45c
	75 Kg/ha N + 7.5 t/ha PM	10.78b	79.03bc	161.50b
	75 Kg/ha N + 10.0 t/ha PM	10.95b	77.65a	163.64b
	75 Kg/ha N + 12.5 t/ha PM	12.28a	76.05a	169.67a
Clem	0	7.76f	86.00d	139.00g
	75 Kg/ha N + 2.5 t/ha PM	8.44de	80.76c	153.90d
	75 Kg/ha N + 5.0 t/ha PM	8.95de	79.00bc	157.95c
	75 Kg/ha N + 7.5 t/ha PM	9.45cd	78.65bc	160.80b
	75 Kg/ha N + 10.0 t/ha PM	10.28bc	77.95ab	164.00b
	75 Kg/ha N + 12.5 t/ha PM	10.61b	77.00ab	168.67a

*Means with the same letter in the same column are not significantly different at 5% using Duncan multiple range test; WAP = weeks after planting.

DISCUSSION

The poultry manure (PM) used was slightly richer in the plant nutrients compared to un-amended experimental soils of the study locations.The nutrient composition of the poultry manure has the potential to supply adequate nutrients of nitrogen and phosphorus required for its growth and development of okra crops. Poultry manure (PM) analysis showed that is an excellent source of organic manure. It supplies both macro and micro-nutrients during mineralization, increases the organic matter content of the soil, and consequently enhances the texture, structure, aeration, moisture holding capacity, nutrient retention and water infiltration in the soil (Akinrinde *et al*., 2006; Dekissa *et al*., 2008). According to Garge and Bahla (2008), PM supplies phosphorous more readily to plants than other organic sources.

These results are similar to the finding of Brown *et al*. (1995), who reported that the growth of okra plant was markedly influenced by the application of organomineral, NPK fertilizer and their combination as observed from the increased plant height and number of leaves compared to the control. This result is similar to those obtained by Naim and Abker (2016) who observed a great increase in yield of okra when Nitrogen (urea) fertilizer was combined with chicken manure on okra carried under rain fed condition in Sudan. Improving soil fertility through fertilizer application has become a major activity that has enabled the feeding of billions of people worldwide. The combination of organic and mineral fertilizers creates the best conditions of production because organic matter improves soil properties as mineral fertilizers provide plants with the nutrients that are required to increase their agronomic effectiveness (Mukengere, 2010). Similar to the current study, combined sources of fertilizers have been found to bring higher yield in okra. Moyin-Jesu and Ojeniyi (2000) studied the effect of animal manure and crop wastes on yield of okra and found that the amendment of wood ash, ground cocoa husk, rice bran, spent grain and saw dust

with goat, pig and poultry manures enhanced okra yield. Dennis *et al*. (1994) indicated that the combination of organic and mineral fertilizers does not only improve the physical status of the soil, but also improves crop yield. The combined application rates of 75kg NPK and 3 t/ha organo mineral fertilizers gave the best okra performance compared to other treatments (Olaniyi *et al*., 2010). In a similar study, Blay *et al*. (2001) using different levels of organic and inorganic manures observed that combined poultry manure and NPK fertilizers, increased plant height, number of leaves per plant and number of fruits / plantlet and longer and wider girth of okra fruits. Other studies have also observed combined treatments of organic and inorganic manures to produce the highest levels of growth parameters of some crops as compared to the sole applications of either input (Busari *et al*., 2008; Efthimiadou *et al*., 2010). Such observations might be attributed to the complementary effect of the combined inorganic and organic fertilizers. Combining organic and inorganic manures in soil amendments would be more economically beneficial in the production of okra.

CONCLUSION

From the results of the experiments, it was evident that the application of organomineral fertilizer played a vital role in the growth and development of the crop. The study also revealed that organomineral fertilizer can be gainfully harnessed as a fertilizer by small scale farmers because of its availability as compared to inorganic fertilizer. The result obtained in this experiment on the use organomineral in cultivation of okra can be an effective eco-friendly technology of boosting okra production. Therefore, it is recommended that the application of organomineral fertilizer at a range of 7.5 to 12.5 t/ha combined with 75kg N can be recommended for the cultivation of okra. While the LD-88 variety can be selected for cultivation by the farmers as having a higher significant response to the application of organo-mineral fertilizer in the two okra varieties. The promising yield obtained with organomineral fertilizer is a pointer to its potential use as nutrient supply in enhancing vegetable production in Nigeria. The use of organo-mineral fertilizer for okra should be encouraged by farmers because they all contain all the essential elements required by okra; this will bring about yield increase in crop.

REFERENCES

[1]. Akanbi,W.B; Togun,A.O; Adediran,J.A; Olaniyan,A.B; Olabode,O.S. and Olaniyi,J.O. 2000. Effect of split application of organomineral fertilizer on Okra growth, nutrient uptake and fruit yield. *Nigerian Journal of Horticultural Science* , 9: 102-109.

[2]. Akinrinde,E.; Obigbesan,G. and Thomas,G. 2006. Electro-ultrafiltration (EUF) Technique in Relation to Conventional Methods of Soil Testing for the Determination of Available P, Ca, Mg and N in some Tropical Soils. *Journal of Agronomy.* 5. 10.3923/ja.2006.375.381.

[3]. Aladele,S.E.; Ariyo,O.J. and Lapena,R. 2008. Genetic Relationship among West African Okra (*Abelmoschus caillei*) and Asian genotypes (*Abelmoschus esculentus*) using RAPD. *African Journal Biotechnology*, 7: 1426-143.

[4]. Baloch,A.F.; Qayyum,S.M. and Baloch,M.A. 1990. Growth and yield performance of okra (*Abelmoschus esculentus* L) cultivars. *Gomal University Journal Research* 10: 191

[5]. Blay,E.T.; Danquah,E.Y.; Ofosu-Anim,J. and J.K. Ntumy. 2001. Effects of poultry manure and or inorganic on the yield of shallot (*Allium cepa* var - *aggregatum*). *Advance Horticulture Science*. 16(1): 7-12.

[6]. Bray,P.H. and Kurtz, L.T. 1945. Determination of total organic and available

forms of phosphorus in soils. *Soil Science*. 59:39-45

[7]. Brown,J.E.; Kovach,S.P.; Goff,W.D.; Himeirick,D.G.; Tilt,K.M.; Gazaway, W.S; Curtis,L.M. and Tyson,T.W. 1995. Fumigation and mulch affect yield, weight, and quality of 'Pimiento' pepper, *Capsicum annuum L. Journal of Vegetable Crop Production*. 1:71-80.

[8]. Busari,M.A.; Salako,F.K. and Adetunji,M.T. 2008. Soil chemical properties and maize yield after application of organic and inorganic amendments to an acidic soil in southwestern Nigeria. *Spanish Journal of Agricultural Research*. 6:691–699. doi:10.5424/sjar/2008064-362.

[9]. Dekissa,T.; Short,I. and Allen.J. 2008 In: proceedings of the UCWR/ NIWA Annual conference. International Water Resources Education; July 22–24, Durhan, NC

[10]. Dennis,E.A.; C.Anane-Sekyi and G.Affi-Pungu. 1994. The effect of cow dung and mineral fertilizers on the yield of dry season onion gardening in Upper east Region of Ghana. Paper presented at First National Food and Industrial Crops, 25-27 October. Kumasi, Ghana.

[11]. Efthimiadou,A.; Bilalis,D.; Karkanis and Froud,B. 2010. Combined organic and inorganic fertilization enhances soil quality and increased yield, photosynthesis and sustainability of sweet maize crop. *Australian Journal of Crop Science*, 4 (9): 722-729.

[12]. Egbuchua,C.N. and Enujeke,E.C. 2013. Effects of Different Levels of Organomineral Fertilizer on the Yield and Yield Components of Rice (*Oryza sativa* L.) In A Coastal Flood Plain Soil, Nigeria. *International Organization of Scientific Research - Journal of Agriculture and Veterinary Science (IOSR-JAVS)*. 4(2):01-05.

[13]. MoyinJesu,E.I. and S.O. Ojeniyi. 2000. Response of leaf nutrient contents growth and yield of okra to application of sole and amended plant residues. *Proceedings of the 26th Annual Conference of Soil Science Society of Nigeria,* May 22-26, 2000, Ibadan, pp: 126-129.

[14]. Mukengere,B.E. 2010. Evaluation of the efficacy of fertilizer use in the soil of degrades of South Kivu on the culture of the bean corn. Case of the Burhale grouping. *Faculty of Agronomic Sciences and Environment, Evangelical University in Africa, Congo*, pp. 1-59.

[15]. Naim,A. and Abker,N. 2016. Effects of Chicken Manure and Nitrogenous Fertilizer on Growth, Yield and Yield Components of Okra (*Abelmoschus esculentus* (L.) Moench) under rainfed conditions. *International Journal of Scientific and Engineering Research.* 7.

[16]. Olaniyi,J.O.; Akanbi,W.B.; Olaniran,O.A. and Ilupeju,O.T. 2010. The effect of organo – mineral and inorganic fertilizers on the growth, fruit yield, quality and chemical composition of okra. *Journal of Animal and Plant Science*. 9(1):1135-1140.

[17]. Onofri,A. 2011. DSAASTAT (2011). Dipartimento di Scienze Agrarie ed Ambientali (DSAA) (in Italian) Statistical (DSAASTAT) by Dr. Andrea Onofri of Department of Agriculture and Environmental Sciences - University of Perugia Borgo XX Giugno 74 - 06121 Perugia – Italy using Microsoft Excel® macro to perform basic statistical analyses of field trials

[18]. Schippers,R.R. 2000, African indigenous vegetable an overview of the cultivated species. *National Resources Institute (NRI), University of Greenwich, London, United Kingdom* Pp 214.

[19]. Shukla,V. and L.B. Nalk. 1993. Agro-Technique for Malvaceae Vegetables, In: *Ifovance in Horticulture Vol* 5. Malhotra publishing house, New Delhi, India, PP 399-425.