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Growth Response, Herbage Yield and Proximate Contents of Peppermint (*Mentha piperita*) as Influenced by Organic Fertilizer Types

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Abstract

Meeting nutrients requirement is one of the important agronomic conditions for successful introduction of new crops because it has a great influence on growth, the quality and quantity of secondary metabolites which directly or otherwise affect our health. A field experiment was conducted in 2016 at Federal University of Agriculture, Abeokuta (Latitude 7° 14| 8.034 NS, Longitude 3° 26| 13.914 EW and altitude 131 masl), Ogun, State Nigeria to assess the effects of two organic fertilizers on performance of peppermint under tropical condition. The treatments were Gateway organic fertilizer (GOF) and Sunshine organic fertilizer (SOF) at the rates of 0 and 6.5t/ha each pre applied two weeks on 2m x 2m beds, laid out in a Randomized Complete Block Desig or 10 days. The effects of the two organic fertilizers on the number of leaves, vine length and proximate contents of Mentha piperita were not significantly different. However n (RCBD) with four replicates. Mint cuttings of 10 cm length were planted and watered twice daily f moisture content was higher with application of 6.5t/ha SOF compared to control and GOF at 6.5t/ha. Application of SOF and GOF at 6.5t/ha produced similar dry matter content which were not significantly different though GOF had higher value. The treatments had significant effect on fat, ash, crude fiber, crude protein, carbohydrate, vitamin C, and alkaloid and glycoside contents. Application of organic fertilizer resulted in superior performance of pepper mint compared to control, Therefore either Gateway or Sunshine organic fertilizer can be considered as the optimum herbage yield and quality of peppermint.

Introduction

Preliminary work on peppermint as a new crop in Nigeria showed a great potential for its adaptability and cultivation under tropical condition due to climate (Joseph-Adekunle and Daramola, 2014). The leaves of peppermint are picked or harvested used extensively either fresh or dried as spice in culinary to add distinctive aroma and flavor to food or as medicinal herbs. The leaves have a pleasant warm, fresh, aromatic, sweet flavour with a cool aftertaste. Mint leaves are used in tea, beverages, jellies, syrups, candies, and ice creams (Budavari *et al.* 1989). The foliar essential oils are important in beverage, cosmetics and allied industries (Aflatuni, 2005).

Organic farming offers safe and healthy food important for human health and offer environmental protection, and its adoption cuts across temperate and tropical areas of the world (Altieri, 1987). There is increasing consumer awareness on *nutraceutical* potentials of plants food bio-safety and increased income in organic production which has led to increased global demand for organically grown herbs. spices and vegetables (Lampkin, 1990). Use of organic fertilizer exerts positive effects on crop growth, soils and absorption of water and steady release nutrients for vegetable crops growth (Aruleba and Fasina, 2004). Adopted cultivation techniques could have a great influence on growth and quantity of secondary metabolites in organic produce. The study aimed to evaluate the effect of organic fertilizers on the growth response and quality of Peppermint.

Materials and Methods

Twelve beds of 2 m x 2m were manually prepared with 0.5 m alley between them. Gateway organic fertilizer® (GOF) and Sunshine organic fertilizer® (SOF) were pre applied two weeks before planting at the rates of 0 and 6.5t/ha each (0 and 2 kg/.bed) and laid out in a Randomized Complete Block Design (RCBD) with four replicates. Mint vines were cut into 10 cm length and the leaves removed and planted spacing of 50 cm x 100 cm and watered twice daily for 10 days. Data collection commenced 14 days after planting and continued weekly for 14 weeks on vegetative growth parameters - number of leaves and vine length. Herbage yield was determined by harvestings the vines by cutting the vines at 5 cm above soil level at 10, 14 and 18 WAP. The fresh harvested herbage was weighed and then oven-dried at 60℃ for 48 hour determine dry weight at 18 WAP. Foliar Proximate contentment was determined as described by AOAC 1990 in the laboratory. Oil extraction was by hydro-distillation of 100 g of leaves oven dried leaves. The oil was extracted for 8 hours using a Soxlet apparatus and solvent-petroleum ether following the procedure of Guenther, (1972). Data were subjected to analysis of variance (ANOVA) using GENSTAT discovery package and means were separated using Least significant difference (LSD) at 5% probability level.

Results and Discussion

At 4 and 5 WAP cuttings treated with SOF at 6.5t/ha produced higher number of leaves, however at 8 WAP GOF had significantly highest number of leaves compared to SOF and the control treatment. Similar trend was observed for the vine length within the period of observation. Peppermint had superior fresh and dry herbage yield with the application of GOF while SOF did not differ from control treatment

Table 1. **Effects of Organic Fertilizer types on Number of leaves and vine length of Peppermint Weeks after planting in 2016 at Abeokuta, Nigeria**

	Weeks after planting									
	4	5	6	7	8	4	5	6	7	8
Treatment	Number of Leaves/plant					Vine length (cm)/plant				
Control	107	158	209	282	312	6.25	7	6.68	7.1	7.25
GOF	106	160	244	366	485	4.62	4.43	6.2	6.67	7.3
SOF	162	174	218	242	233	5.62	6.5	6.38	7.12	8.18
se±	33.1	43.7	86.7	133	175.8	0.923	0.893	1.011	1.178	1.51

Table 2. **Effects of organic fertilizer types on Fresh and Dry Herbage Yield of Peppermint Weeks after planting in 2016 at Abeokuta, Nigeria**

	Weeks after planting					
	10	14	18	10	14	18
Treatment	Fresh Weight (g/plant)			Dry Weight (g/plant)		
Control	26	60	22	7	10.1	5.8
Gateway Organic Fertilizer®	176	170	132	58	30.6	44.7
Sunshine Organic Fertilizer®	31	78	35	9	13.4	8.8
LSD (0.05)	141.4	109.6	85.8	Ns	17.32	ns
se±	40.9	22.4	31.7	7.08	24.8	11.84

Applications of the organic fertilizers were not significant on the Carbohydrate, crude fibre, Glycosides and vitamin C contents. The Alkaloid content was significantly higher in control treatment compared to GOF and SOF which had similar values. The ash, protein, dry matter and moisture contents were significantly affected by the treatments. The positive response of Peppermint to the organic fertilizers is in line with assertion of Murray *et al*. 1988 that a high quality of peppermint oil in any region requires the optimum use of fertilizer and water to maintain herbage growth while delaying maturity as long as possible so that the herbage may be harvested with a minimum of flowers (Tables 1-3).

Table 3. **Proximate contents of Peppermint Leaves as influence by Organic fertilizer types 18 WAP in 2016 at Abeokuta, Nigeria**

Treatment	Proximate Contents									
	Alkaloids	Ash	CHO	Crude Fibre	Crude Protein	DM	Fat	Glyco	Vit C	MC %
Control	2.40	8.65	47.57	12.89	14.24	86.41	3.15	0.77	118	13.51
GOF	2.30	8.98	47.29	13.48	16.23	90.43	4.57	0.82	107	9.54
SOF	2.35	9.66	46.19	14.69	18.15	93.26	4.39	0.797	114.3	6.74
LSD (0.05)	0.075	0.77	Ns	ns	1.042	1.02	0.82	ns	ns	0.957

GOF= Gateway Organic Fertilizer, SOF= Sunshine Organic Fertilizer, CHO = Carbohydrate, Glyco = Glycoside, MC = Moisture Content, DM =Dry matter

Conclusion

Incorporation of the two organic fertilizers both had beneficial effects on growth of Peppermint, herbage yield, dry matter yield and foliar proximate contents. The Alkaloids content decreased with the organic addition which is a good indication of food safety.

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