Comparative studies of five accessions of *Abelmoschus esculentus* L.(Moench) as influenced by arbuscular mychorrizae fungus,spent mushroom compost and poultry manure

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Introduction

Okra *Ablemoschus esculentus* L. (Moench), a member of family Malvaceae, is widely cultivated vegetable of high nutritional values in human diet (Dikwahal *et al.,* 2006; Jonathan *et al.,* 2011). It is a good source of protein, carbohydrate, vitamin C and calcium (Kahlon *et al.,* 2007; Arapitsas, 2008). The leaves, stems and fruits are also economically important in paper and pharmaceutical industries (Gopalan *et al.,* 2007; Dilruba *et al.,* 2009). The poor soil fertility and low yielding genotypes are threats to okra production (Adeyemi *et al.,* 2008; Saifullah and Rabbani, 2009; Olawuyi *et al*., 2012). Spent mushroom compost also known as Spent Mushroom Substrates, (SMS) has been found useful as soil conditioner, soil ameliorant and potential organic fertilizer (Fasidi *et al.,* 2008;; Jonathan *et al*.,2013). Arbuscular mycorrhiza fungi (AMF) form symbiotic relationship with the roots of plants and improve the uptake of phosphorous in the soil (Osonubi *et al.,* 1991; Olawuyi *et al*., 2011a). Poultry manure is used as soil amendment and contains fairly high nutrient composition particularly nitrogen than other sources of animal manure (Ismail *et al.,* 1996). However, this work was carried out to evaluate the growth and yield response of okra to spent mushroom compost (SMC), Arbuscular mychorrizae fungi (AMF) and Poultry manure (PM).

Material and methods

The SMC (*Pleurotus pulmonarius*) was collected from a mushroom farm in Ibadan,Nigeria; while AMF (*Glomus mosseae)* and PM were obtained from University of Ibadan Teaching and research farm. The NG/TO/02/12/156, NG/OA/03/12/157 and NG/OA/05/12/159 were genotypes sourced from the National Centre for Genetic Research and Biotechnology, Ibadan, while IJ-OND Okr 1 and IJ-OND Okr 2 were accessions from two markets in Ijare, Nigeria. An on-farm trial was conducted at the nursery farm of the Department of Botany, University of Ibadan. The experiment was laid out factorially in a complete randomized design with eight treatments and three replications. A total of 120 plants in treatment combinations of SMC, AMF and PM were evaluated. Two seeds of okra were sown at a depth of 1cm in each of the sterile polythene bag filled with 5kg of loamy soil, and arranged in accordance to its treatments. Thinning to one plant per plot was done after one week, and all agronomic practices were duly carried out. Data were subjected to analysis of variance to determine the levels of significance, while treatment means were separated using Duncan multiple range test($P<0.05$).

Results and Discussions

The result from table 1 showed that the accession had significant ($p<0.05$) effect on plant height and leaf length, but non significant for number of leaves and leaf width. The effect of replicates,

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treatment, week after planting and interaction of replicate x treatment were highly significant (P<0.01) for plant height, number of leaves, leaf length and leaf width .The effect of treatment x weeks after planting was significant for number of leaves and leaf length, while the interactions of replicates and weeks after planting were not significant for all the growth characters. The interaction level of replicate x treatment x accessions produced significant effect for leaf length and leaf width, while the effect of replicate x weeks after planting x accessions and replicate x treatment x weeks after planting were non- significant for all the characters Again, significant differences were recorded for treatment effect on growth and yield parameters of okra (Table 2).The height of okra plant treated with combination of mycorrhizal fungus (AMF) and spent mushroom compost was the highest (41.93cm), and not significantly different from plant treated with SMC, AMF +PM, PM + SMC and control, but different from other treatments. AMF + PM and AMF + SMC treatments for number of leaves, leaf length and leaf width were significantly higher and different from other treatments, while AMF, PM , SMC and combinations of AMF + PM treated plants were significantly the same. Again, the plant treated with AMF only had the highest values of fruit weight and fruit length of 45.24g and 17.27 cm respectively, while total number of fruit , fruit width , dry weight and seed weight per plant for AMF only and AMF + SMC treated plants were significantly higher than other treatments. The yield performance of Okra plants treated with spent mushroom compost and mycorrhiza fungus conforms to the findings of Odebode *et al*. (1998), Jonathan *et al.* (2012a) and Olawuyi *et al.* (2011b). The positive response of the number of leaves produced per plant in *A. esculentus* to SMC could be attributed to the mineral uptake of the plants. This observation was similar to the report of Jonathan *et al.* (2012b) on the influence of SMC on *Telfairia occidentalis.*

Table 1: Interactions of accessions, replicates, stages of growth and treatments of AMF, PM and SMC on Okra

Source of Variation	Df	PH	NL	LL	LW
Accession(ACC)	4	3038.5*	269.4ns	70.97*	148.68ns
Replicate (REP)	2	2937.8**	115.9**	113.1**	23.7**
Treatment(TRT)	7	2401.8**	120.9**	125.9**	188.1**
Week After Planting (WAP)	6	46964.9**	537.9**	1932.0**	3358.3**
REP x TRT	14	1115.0**	57.5**	74.7**	92.2**
REP x WAP	12	222.4ns	5.1ns	1.9ns	8.2ns
TRT x WAP	42	238.0ns	19.4*	16.8*	24.1ns
REP x WAP x ACC	48	52.0ns	7.0ns	5.00ns	8.36ns
REP x TRT x ACC	56	838.9ns	40.66ns	38.40*	67.87*
REP x TRT x WAP	84	107.1ns	6.9ns	8.3ns	11.3ns
TRT x WAP x ACC	168	91.8ns	9.9ns	7.35*	10.74ns
REP x TRT x WAP x ACC	334	94.7ns	5.9ns	5.49*	9.62ns
Error	3				
Total	841				
Corrected Total	840				
CV%					

*P<0.05= significant ** P<0.01= highly significant, ns= non- significant, PH-Plant height, NL-Number of leaves, LL-Leaf length, LW-Leaf

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Table 2: Effect of treatment combinations of AMF, SMC and PM on growth and yield characters of okra

PH-Plant height, NL-Number of leaves, LL-Leaf length, LW-Leaf width, TNF-Total number of fruit, FW-Fruit weight per plant

Treatment	PH(cm)	NL	LL(cm)	LW(cm)	TNF	FW(g)	FL(cm)	FWD(g)	DW(g)	SW(g)
AMF	38.73^{ab}	7.21^{bc}	10.69^{cd}	12.09^{b}	7.33^{a}	45.24^{a}	17.27^{a}	20.87^{a}	5.89^{a}	3.10^{a}
PM	35.49^{b}	8.07^{b}	10.77^{cd}	12.54^{b}	6.00^{ab}	35.55^{b}	15.93^{ab}	17.54^{ab}	4.31^{ab}	2.40^{ab}
SMC	40.01^{a}	6.87^{c}	10.38^{d}	11.97^{b}	5.87^{b}	30.83^{c}	14.17^{b}	15.47^{b}	4.18^{ab}	2.11^{ab}
AMF+PM	40.33^{a}	9.66^{a}	12.01^{ab}	12.66^{b}	6.80^{ab}	32.55^{bc}	14.63^{b}	18.48^{ab}	4.12^{ab}	2.94^{ab}
AMF+SMC	41.93^{a}	8.08^{b}	12.45^{a}	14.34^{a}	7.87^{a}	42.44^{ab}	14.15^{b}	19.36^{a}	5.75^{a}	3.12^{a}
PM+SMC	40.86^{a}	6.91^{c}	10.43^{d}	12.21^{b}	5.93^{b}	29.99^{c}	13.83^{bc}	12.25^{bc}	4.41^{ab}	2.61^{ab}
AMF+PM+ SMC	27.35^{c}	6.14^{c}	8.93^{e}	10.18^{c}	5.07^{bc}	32.53^{bc}	12.00^{bc}	11.58^{c}	2.94^{b}	1.64^{b}
CONTROL	40.63^{a}	7.20^{bc}	11.48^{bc}	12.66^{b}	3.13^{c}	16.69^{d}	9.16^{c}	4.01^{d}	2.07^{b}	1.39^{bc}

DW-Dry weight per plant, SW-Seed weight per plant, FL-Fruit length per plant, FWD-Fruit width per plant
Means with the same letter in the same column are not significantly different at P< 0.05 using Duncan's Multiple Range Test (DMRT).

Conclusion

The findings from this study revealed the influence of the bioinoculants on the morphological and yield related traits in okra. The genotypes responded positively to the interaction of mycorrhizae fungus and mushroom compost compared to control.

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