YIELD ATTRIBUTING CHARACTERS AND BIOMASS ACCUMULATION OF SAFED MUSLI AS INFLUENCED BY FYM AND FLY ASH APPLICATION

ABSTRACT

Aims: The present study aims to evaluate the yield attributing characters and biomass accumulation of safed musli influenced by FYM and fly ash application in India.

Study design: The field experiment was conducted during 2013-2014 at Nagarjuna Medicinal Plants Garden, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (M.S.).

Results: There were three levels of FYM and four levels of fly ash with three replications in FRBD on Inceptisol with a view to study the effect of FYM and fly ash application on yield, quality and nutrient uptake of safed musli. As the physiological maturity of the crop begins at 85-90 days after sowing (DAS) the growth observations e.g. number of leaves, leaf area was recorded at 30, 60 and 90 days after sowing. The number of leaves was successively increased with each growth stage up to 60 days Significantly highest leaf area was recorded with the application of 20 t FYM ha^{-1} (M_2). Significantly highest leaf area (29.56 cm^2) was recorded at 60 DAP with the application of 15 t fly ash ha^{-1} which was at par with 10 t fly ash ha^{-1} (F2) and 5 t fly ash ha^{-1} (F1). Significantly highest dry matter accumulation was recorded with the application of 20 t FYM ha^{-1}, however, it was at par with 10 t FYM ha^{-1}. The highest biomass accumulation was observed with 15 t fly ash ha^{-1} (F3) which was at par with 10 t fly ash ha^{-1} (F2) and 5 t fly ash ha^{-1} (F1).

Conclusion: The thermal industrial waste like fly ash showed a promising option for nutrient management in medicinal crop plant like safed musli which can substitute to some extent costly chemical fertilizer and improve the qualitative value of safed musli.

Key word: FYM , fly ash, Safed musli, DAP (Days after planting)

Introduction

The use of fly ash in agriculture increase the yields of agricultural produce (Kene *et al.* 1991, Bhoyar 1998, Meshram 2007). The use of Farm yard manure (FYM) in agriculture for yield improvement and soil conditioning has also been well documented (I.C.A.R., 1987). The present

investigation was undertaken to study the effect of Fly ash as well as FYM on physicochemical properties of soil. Study on cracking pattern is a simple test which indicates the general swell shrink behaviour of the soil. During fallow phase of cultivation cracking pattern decides the water loss from the soil mass particularly from the deeper layers (Reddy et al., 2017). Climate variability impact on the Frequency of Occurrence of Mesoscale Convective Systems in Northern Nigeria was studied by Ochei & Oluleye (2017). Mesoscale Convective Systems (MCSs) form an important component of meteorology in West Africa, and in particular, contribute substantially to precipitation totals. Several authors focused majorly on the contribution of these systems to precipitation and the damages that accompanied it (Ochei & Oluleye, 2017; Ochei et al., 2015). In the tropics, thunderstorms and squall lines are responsible for at least 70% of the rainfall in the coastal region (south) and over 95% in the Sahel (north). But this work was improved upon by Orisakwe (2015).

Material and Method

The field experiment was conducted during 2013-2014 on Inceptisol at Nagarjun Medicinal Plants Garden, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra). There were three levels of FYM (0, 10 and 20 t ha^{-1}) and four levels of fly ash (0, 5, 10 and 20 t ha^{-1}) with three replications arranged in FRBD. Fly ash and FYM were applied before transplanting safed musli (*Chlorophytum borivilianum*). The fly ash was collected from Thermal Power Station, Paras, Balapur, Dist. Akola (Maharashtra). Physico-chemical properties of the soil were studied after harvesting Safed musli. The growth observations viz, number of leaves and leaf area were recorded upto 90 days. As after 90 days defoliation of the plants usually occurred in Safed musli. The number of leaves was recorded up to 90 DAP. The leaf area (cm^2) as influenced by various treatment was recorded after 30, 60 and 90 DAP by using the graphical method. Treatment wise plant and root biomass were selected randomly from each net plot and fresh weight recorded then Plant samples were air dried in shade and placed in oven at 65^0 C till the constant weight obtained. The data were statistically analysed following Panse and Sukhatme (1967).

Table 1: Nutrient content in FYM and Fly Ash

Sr. No	Nutrients in Fly ash	Value
1	Total nitrogen (%)	0.038
2	Available nitrogen (%)	0.0025
3	Available phosphorous (%)	0.0034
4	Available potassium (%)	0.056
5	DTPA extractable Fe (ppm)	4.79
6	DTPA extractable Zn (ppm)	1.09
7	DTPA extractable Mn (ppm)	0.48
8	DTPA extractable Cu (ppm)	1.32

Sr. No	Nutrient content in FYM	Value
1	Nitrogen (%)	0.44
2	Phosphorous (%)	0.19
3	Potassium (%)	0.68
4	DTPA extractable Fe (ppm)	
5	DTPA extractable Zn (ppm)	
6	DTPA extractable Mn (ppm)	
7	DTPA extractable Cu (ppm)	

Table 2: Initial Soil status at the start of the experiment

Sr. No.	Soil characteristics	Content
A	**Physical properties**	
1	Bulk density (Mg m^{-3})	1.54
2	Maximum water holding capacity (%)	45.85
3	Porosity (%)	37.39
4	Hydraulic conductivity (cm Hr^{-1})	0.86
B	**Chemical properties**	
1	pH(1: 2.5)	8.20
2	EC (dSm^{-1})	0.32
3	Available N (kg ha^{-1})	180.85
4	Available P (kg ha^{-1})	13.67
5	Available K (kg ha^{-1})	261.35
6	DTPA Mn (mg kg^{-1})	2.24
7	DTPA Zn (mg kg^{-1})	0.90
8	DTPA Cu (mg kg^{-1})	2.28
9	DTPA Fe(mg kg^{-1})	3.82

Table 3: Number of Leaves plant^{-1} and Leaf area plant^{-1} (cm^2) as influenced by FYM and Fly ash application

Treatments	No. of leaves			Leaf area		
	Days After planting			Days After planting		
	30	60	90	30	60	90
FYM levels (t ha^{-1})						
M0 (0)	9.92	16.00	14.08	22.33	27.58	25.58
M1 (10)	10.25	15.75	15.42	23.58	29.42	27.33
M2 (20)	10.92	15.75	15.92	23.25	30.17	27.33
SE(m)±	0.38	0.26	0.23	0.30	0.21	0.28
CD at 5%	NS	NS	NS	0.88	0.60	0.83
Fly ash levels (t ha^{-1})						
F0 (0)	9.89	15.44	14.11	23.00	28.33	26.56
F1 (5)	10.00	16.33	15.22	23.22	29.00	26.44
F2 (10)	10.89	16.11	15.44	23.00	29.33	27.00
F3 (15)	10.67	15.44	15.78	23.00	29.56	27.00
SE(m)±	0.44	0.30	0.27	0.35	0.24	0.33
CD at 5%	NS	NS	NS	NS	0.69	NS
Interaction effect (FYM x Fly ash)						
SE(m)±	0.75	0.52	0.46	0.60	0.41	0.57
CD at 5%	NS	NS	NS	NS	NS	NS

Table 4: Dry Matter accumulation (q ha^{-1}) as influenced by FYM

And Fly ash application

Treatments	Plant Leaf biomass			Root biomass		
	Days after planting			Days after planting		
	30	60	90	30	60	90
FYM levels (t ha^{-1})						
M0 (0)	**1.28**	**1.58**	**1.47**	**2.84**	**2.88**	**3.61**
M1 (10)	**1.32**	**1.63**	**1.53**	**3.02**	**3.78**	**4.85**
M2 (20)	**1.34**	**1.64**	**1.60**	**3.16**	**3.88**	**6.34**
SE(m)±	**0.01**	**0.01**	**0.04**	**0.10**	**0.11**	**0.08**
CD at 5%	**NS**	**0.03**	**NS**	**NS**	**0.33**	**0.24**
Fly ash levels (t ha^{-1})						
F0 (0)	**1.30**	**1.59**	**1.53**	**2.94**	**3.24**	**4.42**
F1 (5)	**1.32**	**1.62**	**1.55**	**3.00**	**3.26**	**4.99**
F2 (10)	**1.33**	**1.62**	**1.54**	**3.05**	**3.76**	**5.1**
F3 (15)	**1.31**	**1.65**	**1.52**	**3.04**	**3.79**	**5.23**
SE(m)±	**0.01**	**0.01**	**0.04**	**0.12**	**0.13**	**0.09**
CD at 5%	**NS**	**0.03**	**NS**	**NS**	**0.38**	**0.27**
Interaction effect (FYM x Fly ash)						
SE(m)±	**0.03**	**0.02**	**0.08**	**0.2**	**0.22**	**0.16**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

Results and Discussion

The number of leaves were successively increased with each growth stage up to 60 days. However, no significant effect of FYM application was noticed on a number of leaves at various growth stages i.e, 30, 60 and 90 DAP. It is revealed from the data presented in Table 3 that fly ash levels also had a non-significant effect on number of leaves recorded at 30, 60 and 90 DAP.

Significantly highest leaf area was recorded with the application of 20 t FYM ha^{-1} (M_2) followed by application of 10 t FYM ha^{-1} (M_1). This might be due to the availability of plant nutrients in addition to improvement in porosity, infiltration through organic manures, resulted into the increased leaf area significantly. The similar results were also reported by Bordia *et al*. (1995), and Sharma (1996).

The fly ash levels had non-significant effect on leaf area recorded during all the growth stages under study except at 60 DAP and significantly highest leaf area (29.56 cm^2) was recorded with the application of 15 t fly ash ha^{-1} which was at par with 10 t fly ash ha^{-1} (F2) and 5 t fly ash ha^{-1} (F1). The incorporation of fly ash in soil was found to be helpful for crop/plant growth was also reported by several workers Warambhe *et. al*., (1991) and Bhople (2006)

Significantly highest dry matter accumulation of leaves was recorded with the application of 20 t FYM ha^{-1}, however, it was at par with 10 t FYM ha^{-1}. Whereas, as dry matter accumulation by roots was found significantly influenced by the application of different levels of FYM at 60 and 90 days after planting. The dry matter accumulation was significantly highest with the application of 20 t FYM ha^{-1} however, it was at par with 10 t FYM ha^{-1} at 60 DAP. The significant effect of FYM application on dry matter accumulation might be due to the supply of balanced nutrients to the crop plants. The dry matter accumulation rate was found rapid to very rapid from 30 days growth period upto 60 days, which was on account of the increased number of leaves and leaf area. During the growth period of 85 to 90 days, the defoliation started in the crop plant may be the reason for non significant result of FYM application on dry matter accumulation.

The highest biomass accumulation was observed with 15 t fly ash ha^{-1} (F3) which was at par with 10 t fly ash ha^{-1} (F2) and 5 t fly ash ha^{-1} (F1). Whereas the dry matter accumulation by roots and plants was non-significant at 30 DAP and dry matter accumulation by plants at 90 DAP During the growth period of 85 to 90 days, the defoliation started in the crop plant may be the reason for non significant results of fly ash application on dry matter accumulation

CONCLUSION

From the present study, it is revealed that the application of 20 t FYM ha^{-1} recorded significantly highest leaf area and leaf and root biomass accumulation at 60DAP. Similarly, significantly highest leaf area, leaf and root biomass accumulation recorded with the application of fly ash @ 15 t ha^{-1} which was at par with 10 t fly ash ha^{-1} (F2) and 5 t fly ash ha^{-1} (F1). Therefore, it is concluded that the application of FYM @ 20 t and fly ash @ 5 t ha^{-1} was found beneficial way to enhance the growth attributing characters and biomass accumulation of Safed musli.

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