Effect of organic nutrient management onquality parameters and yieldof fodder cowpea varieties

ABSTRACT

The field experiment was conducted during*Rabi*season of*,* 2022on sandy clay loam soils at a dry land farm in the S.V. Agricultural College in Tirupati, Andhra Pradesh, India.To study the Effect oforganic nutrient management onquality parameters and yieldof fodder cowpea TheSplit-plot design of the study included three replications.The treatments consisted of four varieties *viz.,* V_1: Vijaya, V_2: MFC-09-01, V_3: MFC-09-03, and V_4: MFC-08-14 assigned to main plots, four organic nutrient management practices *viz.,* F_1: Control, F_2 : 100 % organic source through (FYM) F_3: 75 % organic source through (FYM) + *Rhizobium* + PSB + KSB and F_4: 50 % organic source through (FYM) + *Rhizobium* + PSB + KSB allotted to sub plots. The soil was neutral in reaction (6.8 pH) low in available nitrogen (176kg ha^{-1}) and medium in available phosphorus (27kg ha^{-1}) and low in available potassium (219kg ha^{-1}) status.). The results revealed that among the varieties tested, higher quality parameters*i.e*., (Crude protein content , Total ash content and dry fodder yield) was recorded with MFC-09-01 (V_2)and dryfodder yield (5.8 t ha^{-1}) as well as crude protein (15.1 %), ash content (12.5 %) were obtained with the application of 75 % organic source through (FYM) + *Rhizobium* + PSB + KSB. Furthermore, compared to all other treatments.

*Keywords:*Biofertilizers, fodder cowpea, *FYM*, quality parameters, dry fodder yield , Sandy clay loam soils, quality parameters.

1. INTRODUCTION

India's livestock production is vital to the country's agricultural sector and considerably boosts GDP. Green fodder and dry fodder availability are currently deficient by 35.6 percent and 10.95 percent, respectively [1]. Looking ahead to 2050, the IGFRI Vision 2050 study projects a demand for 1012 million tonnes of green fodder and 631 million tonnes of dry fodder.However, the lack of fodder and its poor quality provide problems for the livestock industry. The gap between the dry and green feed supply is typically 40%; by 2025, this disparity can increase to 45%. To fulfil the vast animal population in India's high fodder demand, there is a need to boost forage crop output and productivity while maintaining soil health and environmental sustainability[2].

When compared to European nations, the production and use of fodderin India paints a very different picture. The country's current fodder resourcescan only supply between 45 and 50 per cent of the demand, and the severity ofthe fodder shortage varies from state to state. The situation is made worse by the expandinglivestock industry, particularly that of genetically modified animals and this isthescenario offodderproduction in India.

Leguminous cowpea (*Vigna unguiculata*) is a popular tropical fodder crop. Because of its rapid growth, it can be grown during the warm and wet seasons. It may be raised on an annual basis. It is raised for green-form feeding, hay production, or ensiling in combinations with sorghum or maize. Cowpea contains 20 per cent crude fibre and 16 per cent crude protein.

Organicnutrientsourcegivesmajoremphasisonrecoveryandmaintenance of soil fertility and for sustainable yield. Organic systems rely on the management of organicmatter to enhance thesoilfertilityandproductivity(Naik*etal*., 2014).Organicmatterhasanoverwhelmingeffectonalmostallsoilproperties.Abestorganicnutrientsourcenotonlyprovidesorganicmatterbutalso add essential minerals to the soil . Organic manure when incorporated in thesoilhaspositiveeffectsonplantgrowth,yieldandsoilphysiochemicalproperties (Huang*etal*.,2007). Biofertilisers help in fixing atmospheric nitrogen and mobilizing fixedmacro-andmicronutrientsinthesoilintoplant-availableforms.Organicfarmingplaysacriticalroleinpreservinglongtermsoilfertilityandsustainability.

Keeping the above facts in view the present study was planned to investigate the effect of applying organic nutrient management FYM, *Rhizobium* ,PSB and KSB in combination on the performance of fodder cowpea varieties under field conditions.

2. MATERIAL AND METHODS

The present investigation entitled "Effect of Organic nutrient managementon quality andyield of fodder cowpea varieties"wasconducteddur*ing rabi*,2022in drylandfarm of S.V.AgriculturalCollege,ANGRAU,Tirupati,whichisgeographicallysituatedat13°56'564"Nlatitudeand79°67'684"Elongitude,withanaltitudeof182.9mabovethemeansealevel.The soil was neutral in reaction (6.8 pH) low in available nitrogen (176 kg ha^{-1}) and medium in available phosphorus (27kg ha^{-1}) and low in available potassium (219kg ha^{-1}) status.The experiment was done using a The Split-plot design of the study included three replications.The treatments consisted of four varieties *viz.,* V_1: Vijaya, V_2: MFC-09-01, V_3: MFC-09-03, and V_4: MFC-08-14 assigned to main plots, four organic nutrient management practices *viz.,* F_1: Control, F_2 : 100 % organic source through (FYM) F_3: 75 % organic source through (FYM) + *Rhizobium* + PSB + KSB and F_4: 50 % organic source through (FYM) + *Rhizobium* + PSB + KSB allotted to sub plots). The crop was sown with a seed rate of 40 kg ha^{-1} at a spacing of 30 × 10 cm.Soil application of biofertilizers was done by mixing 1.25 l ha^{-1} of each bio inoculant in 500 kg of well-decomposed FYM and applied as basal dose (applied 24 hrs before sowing). Seed treatment of biofertilizers was done by mixing 10 ml of each bio inoculant with 1 kg of seed and drying for 10-15 minutes under shade before sowing. Irrigation and weeding were done as and when required. At 50% flowering, harvesting was completed. The data on various parameters were statistically analysed using the split-plot design method recommended by Panse and Sukhatme[6].

2.1 Quality parameters

Crude protein: Totalnitrogencontent of plant samples was estimated by modified Micro kjeldhal method[7] and the crude protein content was estimated by using the following formula which was expressed in percentages.

Crude protein (%) = N (%) × 6.25

Crude fibre: Crude fibre content in whole plant was estimated by acid-alkali digestion method and was expressed in percentage.

$$\text{Crude Fibre}(\%) = \frac{\text{Weight before ashing - weight after ashing}}{\text{Weight of the sample taken}} \times 100$$

Total Ash content :Ashistheinorganiccomponentofthesampleleftaftercompleteignitionof the sample at 600^{o} C in muffle furnace. Ash content was calculated by usingthefollowingformulaand expressedinpercentage

$$\text{Total Ash content } (\%) = \frac{\text{Weight of ash a}}{\text{Weight of oven dry sample}} \times 100$$

2.2Yield parameter

Dry fodder yield: After harvesting of fodder cowpea from net plot area, plants were left in the field for a period of one week for sun drying. Then dry fodder yield of cowpea was weighed in net plot area and total dry fodder yield was expressed in t ha^{-1}.

3. RESULTS AND DISCUSSION

Data pertaining to Qualityparameters and productivity at harvest, as influenced by application of organic nutrient management in fodder cowpea varieties were presented in Tableand discussed in different sections.

3.1 Quality parameters

Crude protein content

Crude protein content , was higher with the variety MFC-09-01 (V_2), which was followed by MFC-08-14 (V_4), which was however comparable with Vijaya (V_1). Thedifferencein quality parameters and dry fodder yield amongthevarietiesmightbedue its genetic potential of having profuse vegetative growth and dry matter accumulation which ultimately led to higher nutrient uptake especially nitrogen, an essential component of protein which might have resulted in more crude protein content in that variety (Iqbal *et al.* (1998).Among the various organic nutrient management practices tried, higher crude protein was higher with application of75 % N through organic source (FYM) + *Rhizobium* + PSB + KSB(F_3).The higher protein content in cowpea was mainly due to stimulatory effect of organic manure on efficiency of soil microbes and mitigates micronutrient deficiency besides supply of major nutrients and improving the physico-chemical properties of soil. These results consistent with findings of Meena *et al.* (2012),Ram*et al*, (2018)

Crude fibre

Crude fibre contentwas higher with the variety MFC-09-03(V_3) followed by Vijaya (V_1) which was however, comparable with the variety MFC-08-14(V_4) whereas the lower fibre content was recorded with the variety MFC-09-01(V_2).Fodders containing low crudefibrecontentare an indication ofmorepalatabilitybyanimalsand they containdigestible nutrients.Thesimilarfindingsobserved by Kalra and sharma (2015), and Saptal*et al*.(2015)**.**

Total ash content

Total ash content , was higher with the variety MFC-09-01 (V_2), which was followed by MFC-08-14 (V_4), which was however comparable with Vijaya (V_1). Thedifferencein quality parameters and dry fodder yield amongthevarietiesmightbedue its genetic potential of having profuse vegetative growth and dry matter accumulation which ultimately led to higher nutrient uptake especially nitrogen, an essential component of protein which might have resulted in more crude protein content in that variety (Iqbal *et al.* (1998).Among the various organic nutrient management practices tried, higher crude protein was higher with application of75 % N through organic source (FYM) + *Rhizobium* + PSB + KSB(F_3).The higher protein content in cowpea was mainly due to stimulatory effect of organic manure on efficiency of soil microbes and mitigates micronutrient deficiency besides supply of major nutrients and improving the physico-chemical properties of soil. These results consistent with findings of Meena *et al.* (2012).Roy*et al*. (2015) and Sharma *et al* (2016).

3.2 Dry fodder yield

Dry fodder ,was higher with the variety MFC-09-01 (V_2), which was followed by MFC-08-14 (V_4), which was however comparable with Vijaya (V_1). Thedifferencein quality parameters and dry fodder yield amongthevarietiesmightbedue its genetic potential of having profuse vegetative growth and dry matter accumulation which ultimately led to higher nutrient uptake especially nitrogen, an essential component of protein which might have resulted in more crude protein content in that variety (Iqbal *et al.* (1998).Among the various organic nutrient management practices tried, dry fodder yield, (tha^{-1})was higher with application of75 % N through organic source (FYM) + *Rhizobium* + PSB + KSB(F_3), which wasfollowed by 50% N through organicsource + *Rhizobium* + PSB + KSB (F_4) which was at par with100 % N throughorganic source (FYM)(F_2),whereas shorterplantswerenoticed in control(F_1). FYMcouldbeattributedtothestimulatedactivitiesof microorganisms and synchronized release of nitrogen, which might havestimulated the cellular activity, useful for the process of cell division. Theresultsareincloseconformitywiththefindingsof Zalate*etal.*(2009),Verma and Munshi (2003).

Table 1Quality parameters and Yield of fodder cowpea as influenced by varieties and organic nutrient management practices

Treatments	Crude protein content %	Crude fibre content %	Ash content %	Dry fodder yield (t ha^{-1})
Varieties(V)				
V_1: Vijaya	13.7	16.9	11.2	4.9
V_2: MFC-09-01	15.7	15.3	13.0	5.3
V_3: MFC-09-03	12.4	18.1	10.1	3.8
V_4: MFC-08-14	14.1	16.3	11.4	5.1
SEm±	0.44	0.61	0.25	0.178
CD(P=0.05)	1.3	1.7	0.7	0.52
Organic nutrient management practices (F)				
F_1: Control	12.9	18.3	10.1	3.6
F_2: 100 %N through FYM	13.8	16.6	11.5	4.8
F_3: 75 % N through organic source(FYM) +*Rhizobium* + PSB +KSB	15.1	15.3	12.5	5.8
F_4: 50% N through organic source (FYM) +R*hizobium* + PSB + KSB	14.1	16.4	11.6	4.9
SEm±	0.42	0.46	0.31	0.291
CD (P=0.05)	1.2	1.3	0.9	0.85
Varieties (V) x Organic nutrient managementpractices (F)				
V at F				
SEm±	0.848	0.924	0.620	0.528
CD(P=0.05)	NS	NS	NS	NS
F at V				
SEm±	0.824	0.953	0.577	0.526
CD(P=0.05)	NS	NS	NS	NS

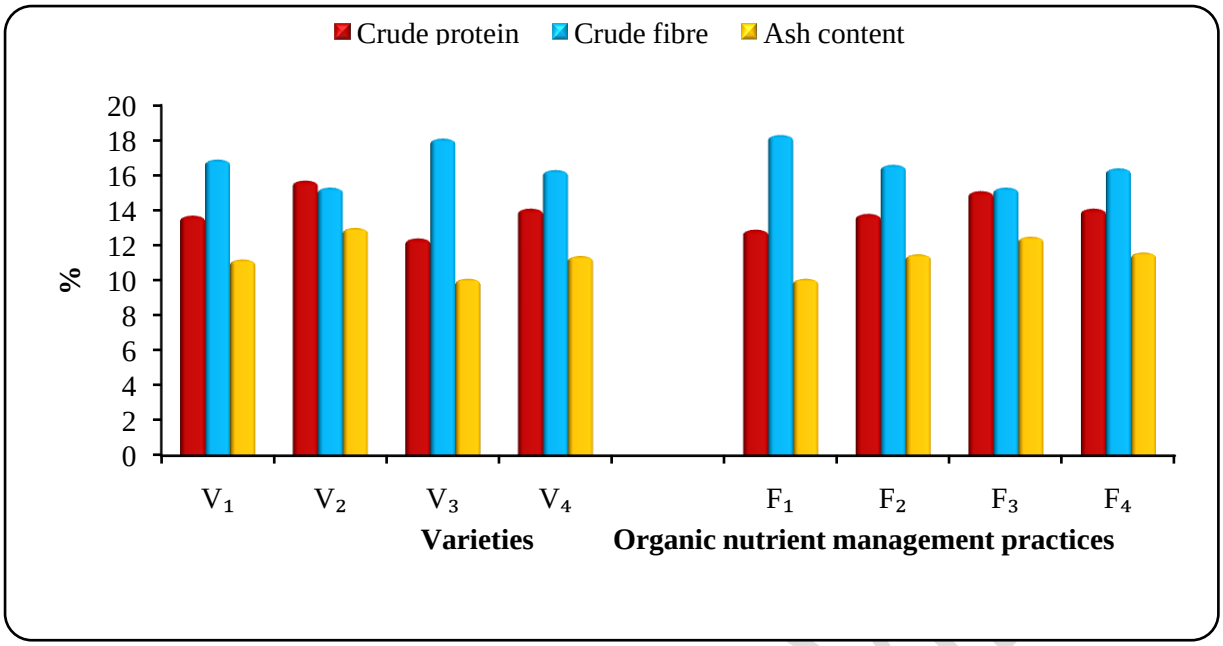

Fig. 1.Quality parametersof fodder cowpea as influenced by varieties and organic nutrient management practices

4. CONCLUSION

In conclusion the study revealed that cultivation of genotype MFC-09-01 with 75 % of N through FYM + *Rhizobium* + PSB + KSB enhanced theyield, quality and economic returns of fodder cowpeain Southern Agro Climatic zone of A.P during *rabi*

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