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Sugarcane based intercropping systems under natural, organic and conventional farming practices

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Sugarcane is an important agro-industrial crop, plays a pivotal role in national economy by sustaining the second largest growing industry in the country next to the textiles. In recent years sugarcane is facing serious problems in terms of sustainability and it is affected by the multiple factors like climate change, escalating cost of production, labour scarcity, slashing sugar price, declining soil health etc. The area and production of sugarcane can be increased through the vertical production of sugarcane and by finding out the efficient agronomic management practices. There is ample scope for intercropping in sugarcane which in turn increase's total production and income per unit area. Imbalanced use of agrochemicals deteriorates the soil and environmental health. Organic sources of nutrients viz. FYM, vermicompost, enriched press mud and biofertilizers provide nutrients and maintain the good soil health for sustained cane yield. There is need to reduce cost of production in sugarcane. Natural farming is a holistic agricultural practice that counters commercial expenditure and market dependency of farmers for inputs like seeds, fertilizers and pesticides. In natural farming, soil is supplemented with the microbial consortium like *Beejamrutha* and *Jeevamrutha* to accelerate the proliferation of soil micro flora which is beneficial to soil which reduce cost of production. Indigenous pesticide decoctions of leaves with cow urine. *Neemastra* and *Bramhastra* etc., are introduced to control pests and diseases. This practice involves locally available biodegradable materials and combines scientific knowledge of ecology and modern technology with traditional farming practices based on naturally occurring biological processes. In view of these an experiment was carried out to validate different farming practices (Natural, Organic and Conventional farming) in sugarcane based intercropping systems.

METHODOLOGY

A field experiment was carried out at Agriculture Research Station, Hukkeri Dist Belagavi, Karnataka, India during

2020-21. The experiment was laid out in split plot design consist of four main plots of farming practices viz., M_1 : Recommended package of practices (RPP), M_2 : Organic farming (FYM @ 25 t ha⁻¹ (basal) + nutrient managed by supplying FYM, vermicompost and enriched pressmud 1/3rd each equivalent to RDN + plant protection with organic products), M_3 : Natural farming (Sett treatment with *Beejamrutha* + soil application of *Jeevamrutha* at fortnightly intervals and foliar spray of *Jeevamrutha* at monthly interval up to 240 DAP + mulching with organic residues + plant protection with natural pesticides / fungicides like *Neemastra*, *Agniastara*, *Bramhastra*, *Shuntiastra* and fermented butter milk and M_4 : Chemical farming and four sub plots as intercropping systems viz., I_1 : sugarcane + cowpea, I_2 : sugarcane + turmeric, I_3 : sugarcane + coriander and I_4 : sugarcane + onion. Totally sixteen treatment combinations were replicated thrice.

RESULTS

Yield and yield parameters of sugarcane were significantly influenced by different farming practices are presented in Table 1. Significantly higher number of millable canes (81775 ha⁻¹), single cane weight (1.49 kg), cane yield (111.6 t ha⁻¹), commercial cane sugar yield (16.37 t ha⁻¹) and sugarcane equivalent yield (133.1 t ha⁻¹) were observed with recommended package of practices than organic farming and natural farming. However, it was on par with chemical farming. Balanced fertilization in recommended package of practices has led to significant increase in nutrient availability for crop uptake and more photosynthesis and accumulation in sugarcane which reflected in significantly higher growth and yield parameters of sugarcane. Yield and yield parameters of sugarcane were significantly influenced by different inter cropping systems. Significantly higher number of millable canes (76303 ha⁻¹), cane yield (102.2 t ha⁻¹), CCS yield (15.03) and SEY yield (134.1 t ha⁻¹) were recorded with sugarcane + turmeric than other intercropping systems. However, non significant differences were observed

Table 1. Yield parameters, yield and sugarcane equivalent yield (SEY) of seasonal sugarcane as influenced by different farming and intercropping systems

Treatments	Number of millable cane ha ⁻¹	Single cane weight (kg)	Cane yield (t ha ⁻¹)	Commercial cane sugar yield (t ha ⁻¹)	Sugarcane equivalent yield (t ha ⁻¹)
Main plot: Farming Practices (M)					
M ₁ - RPP	81775	1.49	111.6	16.37	133.1
M ₂ - OF	71042	1.40	91.1	13.23	109.1
M ₃ - NF	62941	1.28	75.4	10.68	89.7
M ₄ - CF	79340	1.46	108.4	15.86	129.3
S.Em±	536	0.02	1.16	0.24	1.16
C.D. (p=0.05)	1854	0.06	4.03	0.83	4.03
Sub plot: Intercropping systems (I)					
I ₁ -Sugarcane + Cowpea	70999	1.39	92.0	13.21	105.7
I ₂ - Sugarcane + Turmeric	76303	1.44	102.2	15.03	134.1
I ₃ -Sugarcane + Coriander	73815	1.40	96.4	14.06	99.9
I ₄ - Sugarcane + Onion	73982	1.41	96.0	13.84	121.6
S.Em±	1220	0.03	1.98	0.53	1.41
C.D. (p=0.05)	3561	NS	5.79	1.54	4.11

Farming practices (M)

M₁ : Recommended package of practices (RPP)
M₂ : Organic farming (OF)
M₃ : Natural Farming (NF)
M₄ : Chemical farming (CF)

Intercropping systems (I)

I₁ : Sugarcane + Cowpea
I₂ : Sugarcane + Turmeric
I₃ : Sugarcane + Coriander
I₄ : Sugarcane + Onion

with respect to single cane weight among intercropping systems. Higher yield in I₂ was due to growing sunhemp as green manuring crop followed by planting of turmeric which led to increased nutrient availability to sugarcane in turn increase in growth and yield parameters of sugarcane ultimately resulted in higher cane yield as compared to other intercropping systems.

CONCLUSION

Cultivation of sugarcane + turmeric based intercropping system under recommended package of practices recorded

higher yield and yield parameters of sugarcane as compared with other farming practices. The yield reduction was observed to the extent of 19.8 and 32.9 per cent in sugarcane and 18 and 33.1 per cent in sugarcane equivalent yield in organic (M₂I₂) and natural farming (M₃I₃) practices, respectively as compared to RPP.

REFERENCE

Bishnoi and Bhati, 2017. An overview: Zero Budget Natural Farming. *Trends in Bioscience* 10(46): 9314-9316.