International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(6): 311-313

Received: 13-09-2018
Accepted: 14-10-2018

Bhagat SB
Regional Agriculture Research Station, Karjat, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, Maharashtra, India

Nikas SB
Regional Agriculture Research Station, Karjat, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, Maharashtra, India

Dahiphale AV
Regional Agriculture Research Station, Karjat, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, Maharashtra, India

Mhaskar NV
Regional Agriculture Research Station, Karjat, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, Maharashtra, India

Correspondence
Bhagat SB
Regional Agriculture Research Station, Karjat, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, Maharashtra, India

Effect of intercropping and nitrogen levels on growth, yield and uptake of nutrient on finger millet (*Eleusine coracana* G.)

Bhagat SB, Nikas SB, Dahiphale AV and Mhaskar NV

Abstract
The experiment was laid out in split-plot design with three replications. The main plot treatment comprised intercropping system in 1:1, 2:1, 3:1, 1:2 and 1:3 row ratio along with sole finger millet and groundnut and sub plot treatments consisted of three nitrogen levels *viz*. 100 % RDN, 75 % RDN and 50 % RDN + *Azospirillum Rhizobium.* The soil of the experimental plot was low in available nitrogen and available phosphorus, moderately high in available potassium, medium in organic carbon. Total biomass yield was higher in sole groundnut than intercropping system. In case of majority of yield attributes, uptake of the NPK and their values were higher under intercropping of Finger millet + Groundnut in 1:3 row ratio with 100 % RDN ha^{-1}.

Keywords: Finger millet, intercropping, growth and yield attributes, uptake

Introduction
Finger millet (*Eleusine coracana* G.) is an important food grain crop of semi-arid tropics particularly of India and East Africa. Nutritional status of this crop is quite good as it contain protein 9.2 per cent, fat 1.29 per cent, carbohydrates 76.32 per cent, minerals 2.24 per cent, ash 3.90 per cent, calcium 0.33 per cent and vit. A, B and phosphorus in smaller quantity. Beneficial effect of Finger millet + Groundnut intercropping in plains of semi-arid dryland areas are reported by CRIDA (2002) and found intercropping legumes with finger millet distinctly advantageous over sole cropping. As the nutrient needs of intercropping system may be differ from monoculture of their component crops, it is therefore, important to standardize the most profitable level of nitrogen for intercropping system. In any successful intercropping, the pattern of crop geometry should be such that it should offer maximum utilization of all the resources. Hence present investigation was conducted to ensure better interaction of the resources and to improve the profitability of the system.

Materials and Methods
The experiment was laid out in split-plot design with three replications. The main plot treatment comprised intercropping system in 1:1, 2:1, 3:1, 1:2 and 1:3 row ratio along with sole finger millet and groundnut and sub plot treatments consisted of three nitrogen levels *viz*. 100 % RDN, 75 % RDN and 50 % RDN + *Azospirillum/Rhizobium.* The soil of the experimental plot was uniform, level and well drained. It was sandy clay loam in texture, low in available nitrogen (243.00 Kg ha-1), available phosphorus (10.80 Kg ha-1), moderately high in available potassium (231.22 Kg ha-1), medium in organic carbon (12.22 g kg-1) and slightly acidic in reaction (pH 5.49). The sowing was done in the experimental plot on 13th June, 2016 by drilling method at a distance of 30 x 10 cm and by dibbling method at a distance of 30 x 15 cm in respect of finger millet and groundnut, respectively. The other common package of practices was followed time to time and periodical growth observations were recorded. For assessment of intercropping (two crops only), growth attributing characters and different indices have been used to determine advantage of an intercropping system over sole cropping by giving different formulae and content and uptake of the nutrient was also calculated.

Results and Discussion
Growth and development parameters
It is evident from the data presented in previous chapter that a marked effect of intercropping was observed on growth characters of finger millet throughout the crop growth period.

This was evident from the fact that the higher plant height and number of tillers per hill of finger millet was recorded under 1:2, 1:1 and 1:3 row proportions respectively than rest of the treatments. It was observed that treatment T_1 *i.e.* sole finger millet and intercropping of Finger millet + Groundnut (3:1) reported lowest plant height and tillers respectively than rest of treatments. This indicated that with increase in proportion of groundnut, there was more interception of light which made the finger millet plant to grow taller in search of more light. On the other hand number of leaves and dry matter was recorded highest under 1:2 and 1:3 row ratio proportion it was significantly superior over rest of the treatment. Similar line of research findings were reported by Siddeshwaran *et al.* (1987) [4], Shankaralingappa and Rajashekhara (1992) [3].

Yield attributes and Yield

The main objective of agronomist is to increase the economic yield which is grain in case of finger millet. The grain yield per unit area in finger millet is a function of yield attributes of an individual plant *viz.*, number of earhead per hill, number of finger per earhead, weight of earhead per hill, grain weight of per earhead and ultimately the grain yield obtained from the plant. The result revealed that intercropping of Finger millet + Groundnut 1:2 row ratio and intercropping of Finger millet + Groundnut 1:3 row ratio were statistically at par with each but were significantly superior to rest of the treatments in respect of yield attributing character such as number of earhead per hill, number of finger per earhead, weight of earhead per hill, grain weight per earhead except test weight which was found to be non-significant. Thus treatment T_1 (sole finger) recorded highest grain and straw yield over rest of the treatments followed by intercropping of 3:1 proportion thus two treatments found significantly superior to rest of the treatments because of higher plant population per unit area. Plant intercropped with groundnut were more efficient in production of dry matter. This clearly indicated that higher photosynthetic efficiency and less competition for nutrient and other resources. These result are in accordance to the results reported by. More *et al.* (1990) [2] and Singh and Arya (1999) [5].

N, P and K Uptake

The higher grain and straw yield of finger millet recorded under treatment T_5 (finger millet + groundnut 3:1 row proportion) was also attributed to higher nitrogen, phosphorus and potassium uptake than remaining treatments, except sole finger millet where there was more nitrogen, phosphorus and potassium uptake. The higher uptake of nitrogen phosphorus and potassium by finger millet in 3:1 ratio resulted in higher nitrogen, phosphorus and potassium uptake in grain and straw.

Regarding the yield of finger millet, it was observed that the sole crop produced significantly more grain yield than all the other intercrop combination. This was mainly due to the fact that sole crop of finger millet was having significantly higher plant population unit area than the finger millet in the intercropping system and ultimately higher uptake of nutrients. The higher photosynthetic efficiency of finger millet in groundnut intercropping than the sole crop has resulted in its overall superiority in most yield attributes *viz.* number of earhead per hill, number of finger per earhead, weight of earhead per hill, grain weight of per earhead, test weight, than sole crop of finger millet. Therefore, higher photosynthetic efficiency of finger millet was observed in intercropping combination than sole finger millet. Jadhav *et al.* (1983) [1] also reported similar type of results.

Table 1: Effect different intercropping treatments and nitrogen Levels on growth attributing characters of finger millet hill $^{-1}$as affected periodically by different treatments.

Treatment	Plant height	No of functional leaves hill^{-1}	Number of tillers hill^{-1}	dry matter production (g) hill $^{-1}$
Main Plot Treatments (Intercropping)				
T_1. Sole Finger millet	101.06	35.42	3.68	13.11
T_3. Finger millet + Groundnut (1:1)	107.14	34.39	3.21	16.19
T_4. Finger millet + Groundnut (2:1)	104.01	31.33	3.61	14.56
T_5. Finger millet + Groundnut (3:1)	101.29	35.14	3.13	17.13
T_6. Finger millet + Groundnut (1:2)	111.97	42.24	4.23	18.52
T_7. Finger millet + Groundnut (1:3)	105.28	42.61	4.20	20.01
S.E. ±	0.935	1.061	0.18	0.50
CD at 5%	2.688	3.048	0.53	1.44
Sub Plot Treatments (Nitrogen Levels)				
N_1. 100 % RDN	109.95	38.56	4.22	18.00
N_2 .75 % RDN	105.44	36.77	3.54	16.41
N_3. 50 % RDN +*Rhizo./Azo*.	99.97	35.23	3.26	15.36
S.E. ±	0.66	0.75	0.12	0.354
CD at 5%	1.90	2.15	0.36	1.02
S.E. ±	2.53	1.837	0.31	0.866
CD at 5%	7.27	NS	NS	NS
General Mean	105.12	38.85	3.67	16.58

Table 2: Different intercropping treatments and nitrogen Levels on yield attributing characters of finger millet hill $^{-1}$as affected periodically by different treatments.

Treatment	Number of fingers/earhead	Weight of grain/hill (g)	1000 grain weight (g)	Grain yield ha^{-1} (q)	Straw yield ha^{-1} (q)	Total biomass ha^{-1} (q)	Harvest index (%)
Main Plot Treatments (Intercropping)							
T_1. Sole Finger millet	6.18	13.57	2.94	19.03	54.04	73.07	26.15
T_3. Finger millet + Groundnut (1:1)	6.02	16.41	2.71	15.54	40.49	56.03	27.80
T_4. Finger millet + Groundnut (2:1)	5.76	15.56	2.75	15.63	43.60	59.22	26.35
T_5. Finger millet + Groundnut (3:1)	5.82	12.62	3.01	16.91	47.14	64.05	26.40
T_6. Finger millet + Groundnut (1:2)	6.89	19.82	2.77	15.74	37.02	52.78	29.80

T_7. Finger millet + Groundnut (1:3)	6.32	18.25	2.83	11.20	27.84	39.04	28.50
S.E. ±	0.17	0.66	0.09	0.58	1.22	1.33	1.01
CD at 5%	0.51	1.90	NS	1.67	3.51	3.84	NS
Sub Plot Treatments (Nitrogen Levels)							
N_1. 100 % RDN	6.48	17.71	2.96	17.29	43.94	61.23	28.93
N_2 .75 % RDN	6.23	15.69	2.81	15.87	40.88	56.77	28.34
N_3. 50 % RDN +*Rhizo./Azo.*	5.78	14.71	2.72	14.84	39.43	54.27	27.63
S.E. ±	0.13	0.47	0.06	0.41	0.85	0.94	0.68
CD at 5%	0.36	1.34	0.18	1.18	2.45	2.72	1.98
Interaction							
S.E. ±	0.30	1.14	0.15	1.00	2.08	2.32	1.75
CD at 5%	NS	NS	NS	NS	NS	NS	NS
General Mean	6.16	16.03	2.83	16.00	41.42	57.42	27.50

Table 3: Mean value of nitrogen, phosphorus and potassium content and uptake (kg ha^{-1}) in grain and straw of finger millet as affected by different treatments.

Treatments	Grain		Straw		Grain		Straw		Grain		Straw	
	N (%)	N kg ha^{-1}	N (%)	N kg ha^{-1}	P (%)	P kg ha^{-1}	P (%)	P kg ha^{-1}	K (%)	K Kg ha^{-1}	K (%)	K kg ha^{-1}
Main Plot Treatments (Intercropping)												
T_1. Sole Finger millet	1.233	23.49	0.610	33.08	0.406	7.72	0.192	10.72	0.519	9.88	1.553	84.11
T_3. Finger millet + Groundnut (1:1)	1.214	18.91	0.481	19.51	0.396	6.15	0.174	6.73	0.513	7.99	1.394	56.68
T_4. Finger millet + Groundnut (2:1)	1.220	19.10	0.590	25.77	0.380	5.94	0.161	7.03	0.484	7.58	1.280	56.45
T_5. Finger millet + Groundnut (3:1)	1.224	22.39	0.604	28.56	0.398	6.73	0.151	7.17	0.491	8.31	1.140	53.76
T_6. Finger millet + Groundnut (1:2)	1.197	18.02	0.490	18.19	0.381	6.01	0.140	5.20	0.484	7.65	1.204	44.78
T_7. Finger millet + Groundnut (1:3)	1.208	15.97	0.541	15.09	0.383	5.08	0.183	4.80	0.489	6.46	1.276	33.50
S.E. ±	0.032	0.83	0.021	1.30	0.004	0.21	0.005	0.29	0.005	0.29	0.077	3.43
CD at 5%	NS	2.40	0.060	3.76	0.012	0.62	0.015	0.86	0.014	0.84	0.222	9.87
Sub Plot Treatments (Nitrogen Levels)												
N_1. 100 % RDN	1.262	21.74	0.579	25.99	0.407	7.04	0.183	8.04	0.508	8.80	1.453	64.39
N_2 .75 % RDN	1.203	19.3	0.554	23.11	0.388	6.17	0.166	6.85	0.496	7.90	1.275	52.55
N_3. 50 % RDN + *Rhizo./Azo.*	1.184	17.84	0.526	20.97	0.377	5.60	0.152	5.91	0.486	7.22	1.196	47.69
S.E. ±	0.022	0.59	0.015	0.92	0.003	0.15	0.004	0.21	0.004	0.20	0.055	2.42
CD at 5%	0.064	1.70	0.043	2.66	0.008	0.44	0.011	0.60	0.010	0.59	0.157	6.98
Interaction												
S.E. ±	0.055	1.45	0.036	1.11	0.07	0.37	0.009	0.51	0.09	0.50	0.13	5.94
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
General Mean	1.22	19.65	0.55	23.21	0.39	6.27	0.16	6.94	0.49	7.97	1.30	54.88

Conclusion

It can be concluded that higher yield attributing characters, grain and straw yield $ha^{-1}$and uptake of the nutrient was recorded with intercropping of Finger millet + Groundnut should be grown in 1:3 row ratio with the application of 100 % RDN.

References

1. Jadhav AS, Kalbhor PM, Deshpande SV. Intercropping of moong and groundnut in sorghum with different planting patterns under rainfed conditions. J Maharashtra Agric. Univ. 1983; 8(1):63-65.
2. More VG, *et al.* Study of intercropping of some oilseed and pulse crop in *kharif* finger millet under high rainfall condition of *Konkan*. M.Sc. Agri. Thesis, B.S.K.K.V., Dapoli, Maharashtra, 1990.
3. Shankaralingappa BG, Rajashekara BG. Intercropping of legume in finger millet genotype. Farming System. 1992; 8(1-2):24-29.
4. Siddheswaran KC, Ramasamy, Morachan YB, *et al.* Light interception and dry matter production under finger millet based cropping system. Madras Agric. J. 1987; 74(8-9):413-417.
5. Sing RV, Arya MPS. Nitrogen requirement of barnyard millet + pulse intercropping system. Indian Journal of Agronomy. 1995; 46(2):172-175.