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Insect biodiversity of finger millet ecosystem in coastal Odisha

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ABSTRACT

Finger millet, *Elusine coracana* (L) Gaertn belongs to small millet group which is a crop of antiquity and known for its suitability to adverse soil, moisture and weather conditions. Under the umbrella of All India Co-ordinated Small Millet Improvement Project (AICSMIP) the experiment was conducted on varietal screening of finger millet crop against major insect pests and population dynamics of natural enemies during Kharif 2012 at Centre for Pulse Research (CPR), Berhampur, Odisha. Twenty eight entries of initial varietal trial (IVT) along with two local check varieties were included in the experiment. From the observations recorded it was observed that no major insect pests were affecting finger millet crop. During the early growth stage grasshoppers were defoliating the leaves. Among sucking insects only aphid infestation was marked. The observations on subsequent days noticed the naturally occurring predators like spiders and coccinellid predators. The fingers of Ragi provide a perfect niche for breeding and shelter to the spiders who play vital role in natural insect pest control. The crop apart from the resilience to climate also provides a perfect ecosystem and niche for natural beneficial organisms where the damaging insect pests are controlled and needs no external plant protection measures.

Keywords: Small millet; finger millet; coccinellid predators; biodiversity

INTRODUCTION

Odisha state has a geographical area of 155707 sq kms and is divided into ten agro-climatic zones depending upon soil types, topography, rainfall and cropping system. The total cultivated land of the state is 61.80 lakh ha out of which 29.14 lakh ha (47%) is high, 17.55 lakh ha (28%) is medium and 15.11 lakh ha (25%) is low land. The climate of the state is tropical characterized by high temperature, high humidity, medium to high rainfall and short and mild winter. The normal rainfall of the state is 1451.2 mm. Most of the rainfall received in the state is erratic. Coastal region of Odisha is always vulnerable to the natural calamities like cyclones and floods where crop failure is a very frequently occurring phenomenon. So crop diversification and crop selection play vital role in coastal agriculture. In this context small millet crops which have very high resilience to soil, moisture and weather variations are the ideal crops to be selected. The crops under small millet group are finger millet (Ragi), Kodo millet (Kodo), foxtail millet (Kangni), little millet (Kutki), barnyard millet (Sawan) and Proso millet (Cheena). These are short duration crops which require small quantity of water and can be grown under diverse soil fertility conditions. In India a long series of studies to improve the use of minor millets among very poor farmers has multiple beneficial impacts on yield (Adhikary et al 2013). In national scenario the small millets occupy 1.88 Mha and produce 2.01 MT of which finger millet alone covers an annual planting area of about 60 and 78 per cent of production (Anon 2014). Similar trend is also observed in Odisha where finger millet is considered to be the most important one occupying around 169.22 thousand hectares with production of 151.42 thousand tons (Anon 2012). The productivity of finger millet in Odisha is 895 kg/ha which is very low as compared to the national average of 1396 kg/ha.

Finger millet (Ragi) is known for its unique nutritional properties particularly fiber content (3.6 g/100 g), quality protein and mineral composition. Each 100 gram of grains has 354 kilo calories of energy. It has high calcium content (410 mg/100 g) compared to any other cereal coupled with high protein content (7.6 g/100 g). It is an essential food for infants and elderly citizens and patients. Because finger millet has low glycaemic value this food lasts for long time in digestive system which attribute is desirable for sugar patients and particularly hard working people. Finger millet is rich in vitamins like thiamin, riboflavin and niacin and four rare essential amino acids like cysteine, tyrosine, tryptophan and methionine. Due to high potassium content (314 mg/100 g) it increases the inbuilt resistance against bacterial and fungal diseases. The antioxidants present in it reduce the risk of heart, kidney problems and cancer. It is rich in iron content (12.6 mg/100 g) which increases the red blood corpuscles in the blood.

MATERIAL and METHODS

Under All India Coordinated Small Millet Improvement Project (AICSMIP) an experiment was conducted on varietal screening of finger millet crop against major insect pests and population dynamics of natural enemies at Centre for Pulse Research (CPR), Berhampur, OUAT, Odisha during Kharif 2012. The centre is located at the coast of Bay of Bengal. Twenty eight entries of initial varietal trial (IVT) along with two local check varieties were replicated thrice in RBD design. Recommended dose of fertilizers @ 40:20:20 kg N, P_2O_5 and K_2O/ha were provided and no plant protection chemicals were given to maintain the natural activity of insects. The observations on percentage plants and leaves and per cent leaf area damage by defoliators were collected at 30-35 DAS. The percentage of plants affected by sucking pests was also collected at 30-35 DAS. The population of natural enemies/predators was also counted.

RESULTS and DISCUSSION

From the observations recorded in the said experiment it was observed that no major insect pests were affecting finger millet crop. During the early growth stage grasshoppers were defoliating the leaves. The maximum extent of plants damaged by grasshoppers among the tested varieties was 14.2 per cent with 9.6 per cent leaf infestation (Table 1). Among sucking insects only aphid infestation was marked. The damaged plants were up to 35.1 per cent and number of aphids/m^2 was 36 in leaf/ panicle. The observations on subsequent days noticed the naturally occurring predators like spiders and coccinellids. The number of spiders and lady bird beetles per square meter area was 4.3 and 5.3. The population of aphids was naturally controlled by the nymphs and adults of lady bird beetle subsequently. The fingers of Ragi provide a perfect niche for breeding and shelter to the spiders who play vital role in natural insect pest control. Jagadish et al (2008) opined that insecticides are not recommended for control of aphids as the predators of Coccinellidae and Syrphidae families are very active in finger millet ecosystem. The aphids in captivity as well as in field search a plant thoroughly for aphids before moving on to the next (Nath and Sen 1976). The results from other coordinating centres also revealed similar results. From Bangalore centre very low incidence of grasshoppers, myllocerous weevils and ear head caterpillars was reported. The predators like coccinellids, syrphids and predatory spiders remain active throughout the year in finger millet ecosystem (Anon 2014).

It indicates that this crop apart from the resilience to climate also provides a perfect ecosystem and niche for natural beneficial organisms where the damaging insect pests are controlled and needs no external plant protection measures. So for sustainability of agriculture and food security in coastal region the finger millet crop may be cultivated as sole crop or intercrop with least care and maintenance to mitigate natural calamities. Finger millet can be grown in all the cropping seasons (Gowda et al 2006). Apart from Kharif season it can be grown as a summer crop in coastal regions after paddy. Being eco-friendly crop it is suitable for fragile and vulnerable situations and is looked upon as a future crop of sustainable and green agriculture.

REFERENCES

Adhikary S 2013. Conservation of agricultural biodiversity- an experience in the Chota Nagpur plateau region. Journal of Crop and Weed **9(2):** 122-127.

Anonymous 2012. Odisha agricultural statistics 2011-12. Directorate of Agriculture and Food Production, Government of Odisha, India.

Table 1. Incidence of insect pests in finger millet entries of IVT at Berhampur, Odisha during Kharif 2012

Entry #	Entry name	Grasshopper incidence at 30-35 DAS			Aphid incidence at 45 DAS		# predators/m^2	
		Plants infested (%)	Leaves infested (%)	Leaf area damaged (%)	Plants infested (%)	# aphids/ cm^2 leaf	Spiders	Ladybird beetles
1	KMR 126	5.2 (2.39)	1.1 (1.26)	5.1 (2.39)	17.4 (4.23)	25 (5.05)	1.7 (1.46)	5.3 (2.42)
2	DHFMV 26-2	8.6 (3.02)	4.5 (2.23)	7.5 (2.83)	28.6 (5.40)	30 (5.52)	0.7 (1.05)	0 (0.71)
3	BR 105	4.3 (2.19)	3.3 (1.95)	10.3 (3.29)	20.7 (4.60)	18 (4.30)	1.0 (1.22)	0.7 (1.05)
4	PPR1010	7.5 (2.83)	3.2 (1.92)	5.2 (2.39)	28.7 (5.40)	36 (6.04)	1.0 (1.22)	0.3 (0.88)
5	VL 149	11.3 (3.44)	1.7 (1.48)	5.4 (2.43)	25.9 (5.14)	17 (4.18)	0 (0.71)	0.3 (0.88)
6	GPU 84	5.6 (2.47)	1.6 (1.45)	8.9 (3.07)	35.1 (5.97)	16 (4.06)	4.3 (2.20)	1.0 (1.17)
7	WWN 25	14.2 (3.83)	9.6 (3.18)	4.7 (2.28)	32.4 (5.74)	21 (4.64)	1.7 (1.46)	2.3 (1.68)
8	PPR 2773	2.5 (1.73)	3.8 (2.07)	2.3 (1.67)	26.7 (5.22)	23 (4.84)	4.3 (2.20)	2.7 (1.68)
9	DHFMV 78-3	4.8 (2.30)	1.8 (1.52)	3.8 (2.07)	21.8 (4.72)	25 (5.05)	3.7 (2.04)	3.7 (2.04)
10	KMR 128	6.4 (2.63)	5.9 (2.53)	7.3 (2.79)	23.4 (4.89)	29 (5.43)	3.3 (1.95)	3.3 (1.95)
11	DHFMV 10-2	10.0 (3.24)	8.1 (2.93)	2.9 (1.85)	18.7 (4.38)	19 (4.42)	0.3 (0.88)	0 (0.71)
12	PR 202	5.7 (2.49)	4.4 (2.12)	10.1 (3.26)	25.1 (5.06)	28 (5.33)	1.3 (1.34)	2.0 (1.56)
13	BR 145	4.3 (2.19)	3.7 (2.05)	6.5 (2.65)	15.4 (3.99)	15 (3.94)	1.7 (1.46)	2.7 (1.77)
14	PMR 601	1.5 (1.41)	2.1 (1.61)	11.3 (3.44)	23.4 (4.89)	14 (3.80)	1.7 (1.46)	0 (0.71)
15	Br 64	1.9 (1.55)	2.6 (1.76)	8.7 (3.03)	12.8 (3.65)	12 (3.53)	3.7 (2.04)	1.7 (1.46)
16	PEH 1201	3.4 (2.00)	2.1 (1.61)	2.6 (1.76)	24.3 (4.98)	31 (5.61)	2.7 (1.77)	1.3 (1.34)
17	GPU 85	4.7 (2.28)	3.4 (2.00)	6.8 (2.70)	25.3 (5.08)	30 (5.52)	2.7 (1.77)	2.7 (1.77)
18	PPR 1012	4.9 (2.32)	3.6 (2.02)	4.6 (2.26)	17.6 (4.26)	15 (3.94)	1.0 (1.22)	3.7 (2.04)
19	KMR 340	5.6 (2.47)	2.0 (1.56)	9.2 (3.11)	15.0 (3.93)	20 (4.53)	4.3 (2.20)	1.0 (1.17)
20	PR 10-30	11.0 (3.24)	2.0 (1.56)	5.3 (2.41)	19.5 (4.47)	24 (4.95)	2.3 (1.68)	4.0 (2.11)
21	VL 369	9.8 (3.21)	7.6 (2.85)	2.9 (1.84)	12.7 (3.63)	18 (4.30)	1.3 (1.34)	4.7 (2.27)
22	WN 259	6.7 (2.68)	3.1 (1.90)	7.1 (2.76)	18.0 (4.30)	35 (5.96)	2.7 (1.77)	4.3 (2.20)
23	TNAU 1228	12.5 (3.60)	5.4 (2.43)	10.3 (3.29)	24.8 (5.03)	28 (5.43)	2.3 (1.68)	3.7 (2.04)
24	VL 368	7.5 (2.83)	8.0 (2.91)	4.7 (2.28)	22.0 (4.74)	23 (4.95)	3.3 (1.95)	4.0 (2.11)
25	VL 367	3.4 (1.97)	1.6 (1.45)	5.6 (2.47)	25.1 (5.06)	25 (5.05)	3.3 (1.95)	1.3 (1.34)
26	TNAU 1228	4.6 (2.24)	2.7 (1.79)	4.1 (2.17)	19.6 (4.48)	22 (4.74)	2.3 (1.68)	5.3 (2.42)
27	VR 708	3.4 (1.97)	0.8 (1.14)	10.7 (3.35)	17.9 (4.29)	17 (4.18)	0 (0.71)	0.7 (1.05)
28	KR 1007-01	5.1 (2.37)	0.7 (1.09)	8.3 (2.96)	23.0 (4.85)	18 (4.30)	0.7 (1.05)	3.3 (1.95)
29*	Bhairabi	2.8 (1.82)	6.6 (2.66)	5.4 (2.43)	16.0 (4.06)	22 (4.74)	3.3 (1.95)	0 (0.71)
30*	Chilika	5.3 (2.41)	2.4 (1.70)	2.4 (1.70)	24.2 (4.97)	25 (5.05)	3.7 (2.04)	4.0 (2.11)
	SEm	0.03	0.06	0.02	0.01	0.08	0.11	0.13
	$CD_{0.05}$	0.08	0.16	0.06	0.04	0.24	0.32	0.36

*Local check, 29= Bhairabi, 30= Chilika

Anonymous 2014. Annual progress report. All India Coordinated Research Project on Small Millets, ICAR, University of Agricultural Sciences, GKVK, Bangalore, Karnataka, India.

Gowda KTK, Gowda J, Ashok EG, Nagaraja A, Jagadish PS, Sashidhar VR, Sceenappa K, Krishnappa M, Vasanth KR, Somu G, Jagadish BR and Bharathi S 2006. Technology for increasing finger millet and other small millets production in India. Project Coordinating Unit, All India Coordinated Small Millets Improvement Project 2008, ICAR, University of Agricultural Sciences, GKVK, Bangalore, Karnataka, India.

Jagadish PS, Mohapatra HK, Chakravarthy MK, Srivastava N and Nangia N 2008. A compendium of insect pests of finger millet and other small millets. Project Coordinating Unit, All India Coordinated Small Millets Improvement Project 2008, ICAR, University of Agricultural Sciences, GKVK, Bangalore, Karnataka, India, 60p.

Nath DK and Sen B 1976. Some observations on aphidophagous coccinellid beetles in mustard cultivars. Science and Culture **42(5):** 288-290.

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