



E-ISSN: 2320-7078

P-ISSN: 2349-6800

JEZS 2019; 7(1): 795-797

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Received: 02-11-2018

Accepted: 05-12-2018

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Seasonal abundance of spring tail, *Seira iricolor* on different strains of paddy straw mushroom, *Volvariella volvacea* under Hisar condition

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Abstract

The experiment was conducted to study the population dynamics of springtail on five strains of paddy straw mushroom *viz.*, Vv-01, Vv-09, Vv-11, Vv-12, Vv-13 at Haryana Agricultural University, Hisar during 2013 and 2014. The population of springtail was observed throughout the cropping season (August 2013 and April 2014). The maximum mean population of the springtail were recorded at end of crop i.e fourth week as compared to initial population. The population of springtail increased with increased in temperature and relative humidity. So, positive correlation between weather parameters and population of springtail was observed in all five strains. Although population of adult springtail was observed in the bundles of paddy straw but there was no infestation on fruiting bodies.

Keywords: Paddy straw mushroom, spring tail, seasonal abundance

1. Introduction

Mushrooms are the edible fleshy macro fruiting bodies of certain fungi and the edible mushroom have been recognized as a food source by Food and Agriculture Organization (FAO) due to their nutritional quality. Mushroom is a nutritious food with high quality protein, low calorific value, low fat content, valuable minerals and vitamins. More than two hundred species of fungi are reported to be edible throughout the world [1] and there are 20 genera of the mushroom being cultivated throughout the world as food. Just as *Agaricus* means “the mushroom” in the Western countries, to the South East-Asian countries, mushroom is understood to be the straw mushroom. Mainly four species of edible mushroom *i.e.*, *Agaricus bisporus*, *Pleurotus spp.*, *Volvariella volvacea* and milky mushroom (*Calocybe indica*) are cultivated in India. *V. volvacea*, commonly known as the straw mushroom or the Chinese mushroom, also known as “warm mushroom” as it cultivated at relatively high temperature belongs to the family Pluteaceae of the Basidiomycetes [2]. Like most vegetables, mushrooms are a good source of minerals. *V. volvacea* is known to be rich in potassium, sodium and phosphorus and together with calcium and magnesium, these constitute 56 to 70% of the total ash content [3]. In India, paddy straw mushroom was first cultivated in 1940. However, its systematic cultivation was first attempted by [4] in Chennai. Presently this mushroom is very popular in coastal area especially, Orissa, Andhra Pradesh, Tamil Nadu, Kerala and West Bengal which produces 10,000 tonnes per annum. Very little work has been done on the springtail infesting *V. volvacea* in India.

Collembolans were the most abundant insects found on agaric mushrooms [5]. They fed on the basidiospores and hyphae between the hymenial surfaces [6, 7]. Hundreds and thousands of collembolans had been collected from agaric fruit bodies in autumn [6, 7, 8]. To know the population dynamics of springtail under Hisar condition were carried out.

2. Material and Method

The five strains of paddy straw mushroom *viz.*, Vv-01, Vv-09, Vv-11, Vv-12 and Vv-13 were taken forward to study the abundance of springtail. All strains are brought from the Directorate of Mushroom Research, Solan. These cultures of all strains were multiplied on Potato Dextrose Agar medium in petriplate, fresh spawn was prepared by using wheat grains as a substrate. Paddy straw mushroom was cultivated under seasonal condition using standard packages of practices given by the Directorate of Mushroom Research, Solan.

For one bed, 22 bundles of paddy straw, each bundle weighing approximately one kg. Paddy straw bundles were soaked overnight in water. These bundles were arranged (Fig 1) on a raised platform in four layers of the five bundles at right angle, with two bundles on the top, spawning on the

entire surface of the each layer of the bed. On each layer, gram powder (1.5% of the dry weight of straw) along with the spawn was added. One bed was treated as one replication and each strain replicated four times. Population of spring tails were recorded weekly interval from bundles of paddy straw.

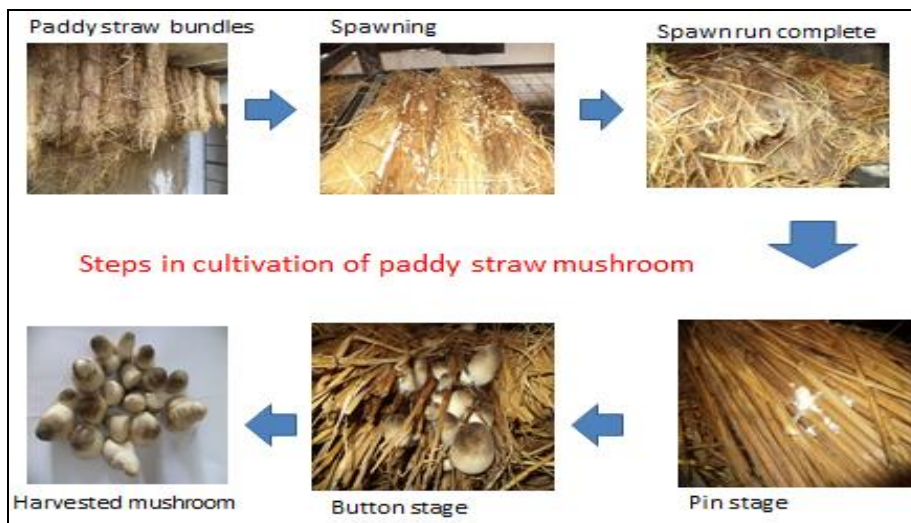


Fig 1: Steps in cultivation of Paddy straw mushroom

3. Result and Discussion

The population of springtail recorded during August 2013 from Strain increases with the cropping period however maximum population were observed in fourth week. During season April 2014 the similar trend were observed in the strain Vv-01, Vv-12, Vv-13, whereas from the strains Vv-09 and Vv-11 the highest population were recorded at second week of cropping season. Pooled mean population of springtail recorded from strains Vv-01 (30.25), Vv-09 (42.25), Vv-11 (27.88), Vv-12 (30.50) and Vv-13 (27.88) (Fig 2).

The mean population of springtail was maximum in the fourth week of a cropping season amongst all five strains of paddy straw mushroom. The population of springtail increased with increased in an average temperature 32.5 to 33.0 °C and relative humidity 71.88 to 83.11 percent (Table 1). The analysis showed that positive correlation of weather parameters with a springtail population (Table 2). The correlation coefficient of average temperature and strains Vv-01(0.980), Vv-09 (0.998), Vv-11(0.943), Vv-12 (0.994), Vv-13(0.990) and relative humidity were Vv-01(0.965), Vv-

09(0.928), Vv-11(0.804), Vv-12(0.912), Vv-13(0.898). The study similar to [9] recorded the positive correlation with weather parameter such as relative humidity and minimum temperature, however contradictory results with maximum temperature it may due to reduction in humidity during the March month in Orissa. Although the population of adult springtail was observed in the bundles of paddy straw but it did not cause infestation in paddy straw mushroom. This might be due to non-compactness of substrate (paddy straw) unlike in white button mushroom damage due to compactness of substrate (compost + casing material) which might helped the springtail settle over the compost. This study is corroborated with [10], they also reported the maximum numbers of springtail during hot and humid climate and *S. iricolor* is active throughout the year on button, oyster, paddy straw mushroom. Maximum activity occurs during July-August on tropical mushroom (*V. volvacea*) whereas, In the absence of mushroom, *S. iricolor* survives on moist organic matter near mushroom house [11].

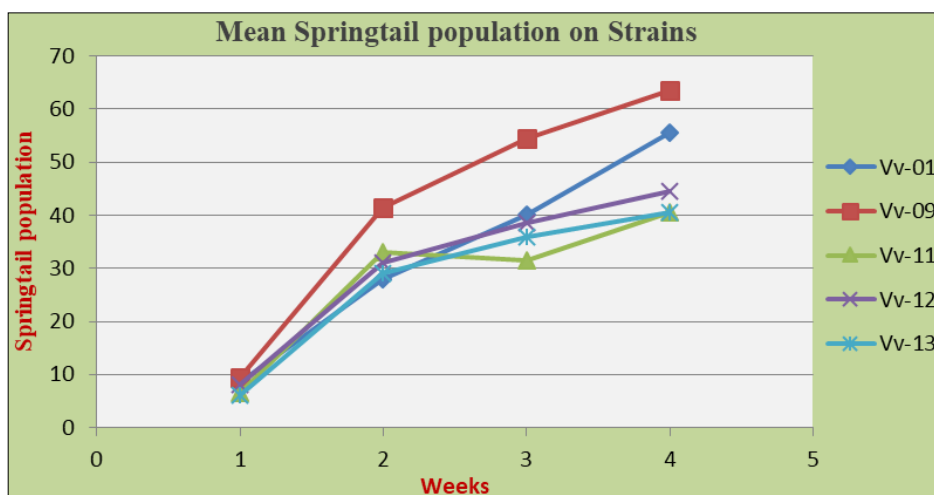


Fig 2: Mean population of springtail on different strains of paddy straw mushroom.

Table 1: Population of springtail in different strains of paddy straw mushroom during August 2013 and April 2014

Weeks	Average temperature			Relative humidity			Strains														
							Vv-01			Vv-09			Vv-11			Vv-12			Vv-13		
	2013	2014	Mean	2013	2014	Mean	2013	2014	Mean	2013	2014	Mean	2013	2014	Mean	2013	2014	Mean	2013	2014	Mean
1	32.0	32.1	32.0	74.38	69.36	71.88	4	13	8.5	7	12	9.5	6	7	6.5	9	7	8	6	6	6
2	32.4	32.8	32.7	73.68	75.48	74.59	29	27	28	29	54	41.5	31	35	33	34	28	31	23	35	29
3	32.9	33.3	32.8	79.51	82.70	81.11	46	34	40	65	44	54.5	35	28	31.5	43	34	38.5	31	41	36
4	33.2	33.4	33.3	82.95	84.06	83.51	64	47	55.5	84	43	63.5	47	34	40.5	54	35	44.5	34	47	40.5
Mean	32.63	32.90	32.76	77.63	77.90	77.77	35.75	30.25	33.00	46.25	38.25	42.25	29.75	26.00	27.88	35.00	26.00	30.50	23.50	32.25	27.88

Table 2: Correlation between weather parameters and mean population of springtail during 2013 and 2014

Independent Parameters (X)	Dependent Factor(Y)	Correlation co-efficient (r)	Regression Equation value	R ² Values
Average Temperature (°C)	Vv-01	0.980	y = 33.873x - 1077.2	R ² = 0.95
	Vv-09	0.998	y = 41.089x - 1304.4	R ² = 0.99
	Vv-11	0.943	y = 24.291x - 768.27	R ² = 0.88
	Vv-12	0.994	y = 27.696x - 877.24	R ² = 0.98
	Vv-13	0.990	y = 26.468x - 839.63	R ² = 0.98
Average Relative Humidity (%)	Vv-01	0.965	y = 3.5175x - 240.57	R ² = 0.93
	Vv-09	0.928	y = 4.3454x - 294.47	R ² = 0.79
	Vv-11	0.804	y = 2.184x - 141.98	R ² = 0.64
	Vv-12	0.912	y = 11.95x - 11.45	R ² = 0.94
	Vv-13	0.898	y = 2.5293x - 168.83	R ² = 0.80

X=Weather parameters, Y=Springtail population on different strains

Collembolans were the most abundant insects found on agaric mushrooms (). They fed on the basidiospores and hyphae between the hymenial surfaces (Sawahata *et al.*, 2000, 2001) [6, 7]. Hundreds and thousands of collembolans had been collected from agaric fruit bodies in autumn (Sawahata *et al.*, 2000, 2001; Nakamori and Suzuki, 2005) [6, 7, 8].

4. Conclusion

The springtail population on bundles of all strains were recorded but there was no infestation on the fruiting bodies of paddy straw mushroom. There was positive correlation with weather parameter during cropping season were recorded. However the springtail may reduce the spawn run with the bundle by feeding on mycelium. The further evaluation of damage on the spawn run time with different densities of springtail will be carried out.

5. Acknowledgement

The first author gratefully acknowledges Department of Agricultural Entomology and Department of Plant Pathology, Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana for providing institutional infrastructure facilities to conduct experiments. Author also thankful to Dr. O. P. Ahlawat, DMR, Solan for providing strains of paddy straw mushroom.

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