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Insect Pests of Ragi Value Added Products and Their Incidence at Different Localities

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Abstract

Investigations were carried out to study the insect pests of ragi value added products at different localities recorded incidence of *Sitophilus oryzae, Corcyra cephalonica, Callosobruchus maculatus, Tribolium castaneum* and *Lasioderma serricorne* on all ragi value added products during 2009-10. Different places were ZARS storeroom GKVK, V. C. Farm storeroom, Mandya city, Hebbal girl's hostel and PG girl's hostel GKVK. *Sitophilus oryzae, Corcyra cephalonica, Callosobruchus maculates, Tribolium castaneum* and *Lasioderma serricorne* were recorded on ragi value added products namely Hurihittu, Vermicelli, Papad, Sandige except Chakali. The incidence of *S. oryzae, C. cephalonica, C. maculatus, T. castaneum* and *L. serricorne* was maximum during November and relatively less in March, maximum during July to December less from January to June ; maximum from July to December and less during January to June ; maximum during July to December low during January to June ; maximum during January to June respectively at all study locations on all ragi value added products, viz., Hurihittu, Vermicelli, Papad, Sandige. There was no incidence on Chakali. These studies from the maiden reports.

Key words : Insect pests, Ragi products, Incidence.

Finger millet value added products enhances the bioavailability of nutrients, but also improves the overall nutritional quality of grains. It is a storehouse of digestive enzymes and low molecular weight carbohydrates reduces the water holding capacities of foods. Consequently, the liquid food will be low in dietary bulk but high in nutrient density. Diversification of diet is necessary to overcome the nutritional situation in the country. Finger millet grains are commonly infested by store pest like the rice meal moth *Corcyra cephalonica* Stainton which is also known to infest rice, wheat, maize, sorghum and other millets, oilseeds like groundnut, sesame and oilcakes, cottonseed and pulses like redgram, blackgram, cowpea, with a wide distribution in tropical and subtropical countries (1). Although there are several reports of insects of ragi in the field condition, there are no documented reports on storage pests. Therefore it was essential to address this issue. In these direction basic studies was initiated on various aspects. In the present paper studies on incidence of *Corcyra cephalonica* on various value added products, besides their shelf life are presented.

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Methods

The study was initiated during March 2009 and continued till February 2010. For this purpose a

Table 1. Seasonal incidence of *S. oryzae* on Hurihittu, 2009-10 (pooled data).

	Incidence (mean per sample) Location					
Months	ZARS store room	VC farm	Mandya city	Hebbal girl's hostel	PG girl's hostel	Mean
Mar 2009	6.50	5.50	5.00	4.25	4.00	5.05
Apr	8.50	7.18	6.60	6.43	3.75	6.54
May	10.87	10.68	7.23	6.72	4.62	8.01
Jun	17.12	15.06	12.43	7.00	5.87	11.49
Jul	25.06	22.43	20.50	9.43	8.31	17.14
Aug	33.56	33.00	31.00	12.68	11.00	24.24
Sep	45.81	45.12	44.00	15.43	14.68	33.00
Oct	57.81	55.12	52.75	20.00	18.87	40.91
Nov	65.50	63.00	60.12	27.00	24.00	47.92
Dec	43.12	40.68	40.00	20.93	16.56	36.18
Jan 2010	20.12	20.31	16.00	11.68	9.18	15.45
Feb	12.00	15.00	10.00	8.00	7.00	10.40

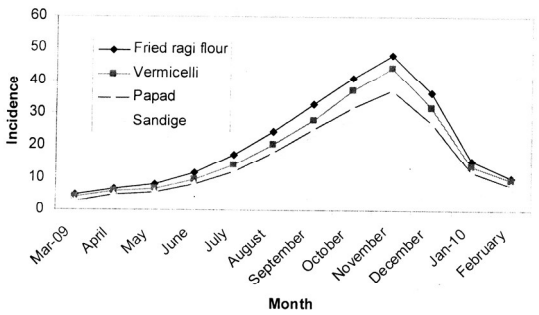

Figure 1. Seasonal incidence of *Sitophilus oryzae* on ragi value added products.

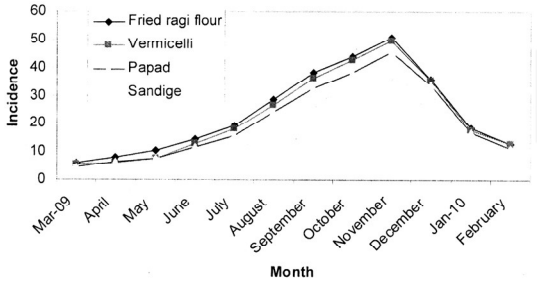

Figure 2. Seasonal incidence of *Corcyra cephalonica* on ragi value added products.

known weight of sample about 200 g of ragi value added products viz., Hurihittu, Vermicelli, Papad, Sandige and Chakali (Muruku) was taken in a plastic container and placed at five different locations viz., ZARS storeroom, V. C. Farm storeroom, Mandya city, Hebbal Girl's Hostel and PG Girl's Hostel and replicated four times. Samples were examined at weekly interval ; further, recorded and counted the insect pests that have occurred on ragi value added products mentioned. Further, the same insect pests were brought to the laboratory in plastic vials for identification and further study.

Absolute counts of insect pests occurred on different ragi products were counted in all the locations at weekly interval. Later the mean number of insects per sample was worked out and the same is presented, in the study.

Results and Discussion

Sitophilus oryzae Linn. (Curculionidae : Coleoptera)

The rice weevil, *Sitophilus oryzae* was found infesting on hurihittu in varying intensities throughout the year. The adult weevil was slightly pinkish to brown in color with four yellow colored spots on the elytra. Both adults and grubs web the product and fed within the product. The incidence of weevil varied from 3.75 to 65.5 at all study locations on Hurihittu.

Table 2. Seasonal incidence of *C. cephalonica* on Hurihittu, 2009-10 (pooled data).

	Incidence (mean per sample) Location					
Months	ZARS store room	VC farm	Mandya city	Hebbal girl's hostel	PG girl's hostel	Mean
Mar 2009	7.00	6.50	6.30	5.50	5.00	6.06
Apr	12.62	8.87	7.50	6.53	5.37	8.17
May	15.00	14.00	8.50	8.31	7.30	10.62
Jun	22.37	20.12	12.50	9.25	8.40	14.52
Jul	27.18	25.50	19.37	12.68	12.12	19.37
Aug	40.87	37.37	31.18	17.18	15.81	28.48
Sep	53.50	50.87	43.50	23.37	20.87	38.42
Oct	63.93	56.37	47.81	27.37	24.31	43.95
Nov	71.37	64.31	60.21	36.12	22.68	50.93
Dec	47.25	46.81	41.18	29.87	13.81	35.78
Jan 2010	25.75	24.12	16.87	17.56	8.56	18.57
Feb	19.12	19.10	10.00	11.93	4.81	12.99

Table 3. Seasonal incidence of *C. maculatus* on Hurihittu 2009-10 (pooled data)

	Incidence (mean per sample) Location					
Months	ZARS store room	VC Form	Mandya city	Hebbal girl's hostel	PG girl's hostel	Mean
Mar 2009	2.50	2.00	1.75	1.60	1.50	1.87
Apr	4.50	4.00	3.50	3.00	2.50	3.50
May	7.50	6.37	4.00	3.25	2.93	4.81
Jun	10.62	10.31	5.06	4.31	2.37	6.53
Jul	15.81	14.18	10.5	5.50	3.06	9.81
Aug	21.50	21.00	17.21	6.93	4.75	14.26
Sep	30.00	29.93	24.56	8.93	8.00	20.28
Oct	39.56	38.12	32.50	12.75	11.00	26.78
Nov	45.37	44.75	40.12	16.68	13.43	32.07
Dec	30.25	33.50	29.00	13.00	11.31	23.41
Jan 2010	12.62	15.50	12.75	6.75	5.50	10.62
Feb	6.62	8.50	7.50	4.12	3.93	6.13

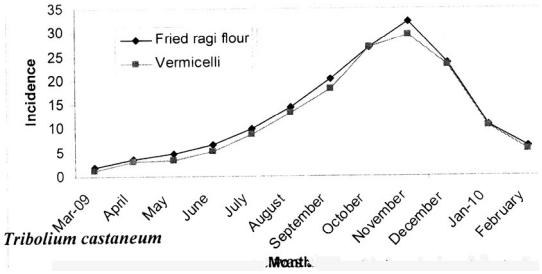

Figure 3. Seasonal incidence of *Callosobruchus maculatus* on ragi value added products.

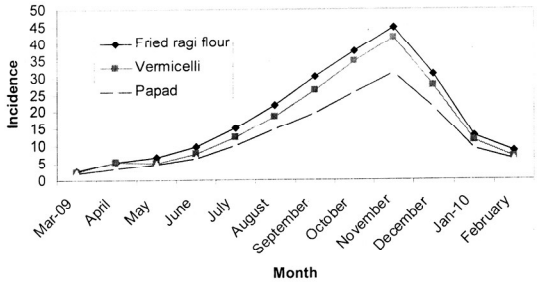

Figure 4. Seasonal incidence of *Tribolium castaneum* on ragi value added.

The incidence was higher during November (65.5 insects/sample) and relatively less in April (3.75 insects/sample).

Almost the same trend was observed on other value products of ragi viz., Vermicelli, Papad and Sandige. Over all, the pest incidence was lower during February to May and maximum during June to January at all locations. There was no incidence of weevil on Chakali (Muruku) throughout the year.

Corcyra cephalonica St. (Pyralidae : Lepidoptera)

The rice moth, *Corcyra cephalonica* St. cause considerable damage to all the products. The adults were comparatively small moths, exhibiting considerable variation in size. They were uniformly dark grey in colour with a few dark hair lines. Newly emerged larva after hatching was very active and started crawling in search of food. After reaching the food, it started scraping or webbing the product. When it was a damaged one, it started feeding on the product. Subsequently, the fecal pellets were used by the larva to form a cluster of products and were found feeding inside the cluster. Latter stage of infestation reveals dense white silken cocoon with damaged products, frass and excreta matted together. The larva is creamy white with yellowish head ; which was the only damaging stage and fed voraciously.

The incidence of *C. cephalonica* varied from 4.81—71.37 insects/sample at all study locations on Hurihittu. The pest incidence was higher during June—January and relatively less from February—May, at all locations on Hurihittu.

Almost the same trend was noticed on other three products namely Vermicelli, Papad and Sandige, at all locations. Further there was no incidence of *C. cephalonica* on Chakali (Muruku).

Callosobruchus maculatus Linn. (Bruchidae : Coleoptera)

The pulse beetle, *Callosobruchus maculatus* is small dark brown and rounded abruptly, grubs fed on fried ragi flour, after mixing the content together. The incidence of beetle was noticed only on fried ragi flour and vermicelli.

The incidence of pest varied from 1.50 to 45.37 insects / sample at all locations. The pest incidence was maximum from July to December and relatively less during January—June at all locations on Hurihittu.

Almost the same trend was observed on vermicelli at all locations. The incidence of pulse beetle was not noticed on Papad, Sandige and Chakali (Muruku) at all locations during the study period.

Tribolium castaneum Herbst. (Tenebrionidae : Coleoptera)

The rust-red flour beetle, *Tribolium castaneum* is small sized, flat and reddish with club shaped antenna. Grubs construct tunnels and fed as they move through flour and adults fed on the product that has already damaged by other insects.

The incidence of lesser grain borer varied from 1.50 to 61.68 insects/sample at all study locations on fried ragi flour. The incidence level was higher during July to January ; relatively low during February and June.

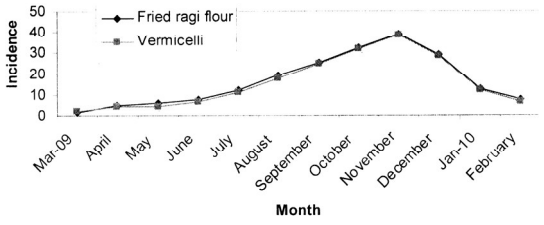

Figure 5. Seasonal incidence of *Lasioderma serricorne.* on ragi value added products.

Almost similar observations were recorded on vermicelli and papad at all locations. The pest incidence varied from 1.50 to 59.62 insects/sample on Vermicelli, while it was 1.75 to 56.43 insects/sample on Papad. The products like Sandige and Chakali (muruku) were free from *T. castaneum* infestation.

Lasioderma serricorne Fb.
(Anobiidae : Coleoptera)

The cigarette beetle, *Lasioderma serricorne* was light brown round beetle, thorax and head bent downward this presents a strongly humped appearance to the insect. The elytra have minute hairs on them. Antenna is of uniform thickness. The grub is white ; both adults and grubs fed freely on all products without webbing ; however, few grubs slightly mixed the flour. The incidence of *L. serricone* varied from 1.50 to 60.12 insects / sample at all study locations on Hurihittu. The incidence was maximum during July to January with peak during November and minimum during February to June at all locations on fried ragi flour.

Almost the similar observations were recorded on vermicelli at all locations. Further the incidence of *L. serricorne* was not found on papad, sandige and chakali (muruku).

Incidence of Inject Pests

The survey work on recording insect pests on stored grains and other products such as rice, maize, sorghum, barley, oilseeds, and pulses was conducted by several scientists in India and other countries. In the present study, five insect pests belonging to two orders of class insecta was recorded under different store rooms at different locations at various intensities. The present study is almost corroborated with the findings of Brar et al. (2), who have recorded more than eight insect pests on oilseeds ; the present study is also corroborated with El-Kashlan et al. (3) who have reported 15 insect pests infesting different stored grains such as wheat, wheat flour barley, and rice in Egypt. In a similar study Rostom (4) recorded 16 species of insect pests as grainivorous on wheat, maize, wheat bran and other dust samples from Riyan and Damnam province of Saudi Arabia. Buchelos and Katopodis (5) recorded 21 insect pests from different products.

The present study is also in agreement with the work of Sonelal and Srivastava (6), who have recorded three insect pests viz., *S. oryzae, R. dominica* and *T. granarium* infesting stored wheat. Borikar et al. (7) recorded eight insect pests on different stored grains of maize and sorghum. Similar work also reported by Bharadwaj et al. (8) on stored maize. The present study also corroborated with the findings of Pande and Das (9), who have recorded more than six insect pests on stored cereals. Similar studies were also reported by Barak and Harain (10). on different stored grain products.

Seasonal Incidence of Major Insect Pests Infesting Ragi Value Added Products

Sitophilus oryzae. In the present study *S. oryzae* infestation was higher during rainy season (June to December) and minimum during Jan to May ; further maximum pest incidence was recorded during November on Hurihittu (Table 1). Almost the same trend was observed on vermicelli, papad and sandige at all locations (Fig. 1). This may be due to variation in climatic conditions such as temperature, relative humidity and rainfall received during the period of investigation at all locations ; all these favoured multiplication and further the pest build up. However, there was no incidence of *S. oryzae* on chakali throughout the period of investigation indicating no preference. However, this investigation needs further studies.

The present study almost corroborated with the findings of El- Kashlan et al. (3), who have reported higher incidence during spring and summer (July to December) on stored grain products. As such there is

no published information on the incidence of *S. oryzae* on ragi value added products to discuss.

Corcyra cephalonica. The rice moth, *C. cephalonica* was noticed throughout the year varied level of infestation at all study locations. The pest incidence was higher during December and lower during February to March at all locations on Hurrihittu (Table 2). Almost similar trend was noticed on other products at all locations (Fig. 2). There was no record of *C. cephalonica* on Chakali (muruku) indicating no preference.

The present study almost corroborated with the report of Ayyar (1), who reported peak activity from June to August and minimum during February on maize. Further Seshagiri Rao (11) reported its incidence less during the periods of high temp and low relative humidity and high during low temperature and high relative humidity as in monsoon. Similarly, Mbata (12), reported high incidence from September to October in Nigeria. The present study also corroborated with the findings of Bandyopadhyaya and Ghosh (13), who also reported higher incidence from July—August in West Bengal. However, the present study, differ with the findings of Atwal (14). Jalali and Singh (15), Srivastava (16), who reported peak activity from March to November. This variation may be due to variation in weather conditions and geography.

Callosobruchus maculatus. The pulse beetle *C. maculatus* incidence was noticed throughout the year. Incidence of the beetle was maximum during July to December and relatively less during January to June on Hurihittu (Table 3). Almost, the same trend was observed on vermicelli at all locations (Fig 3). Further, the pulse beetle incidence was not noticed on other products at all locations indicating no preference.

The pest incidence was more during rainy season because of low temperature and high relative humidity favoring the pest multiplication and builds up. As such there is no published data to discuss.

Tribolium castaneum. The lesser grain borer incidence was also higher during July to January and lower during February to June on all products at all locations (Fig. 4). Further the products Chakali and Sandige were free from *T. castaneum* infestation. The present study is almost in agreement with the findings of El-Kashlan et al. (3) who have reported the occurrence of *T. castaneum* on stored grains in Egypt.

Lasioderma serricorne. The incidence of cigarette beetle was varied from 1.50 to 16.12 at all study locations on Hurihittu. The incidence of pest was maximum during July to January and minimum during February to June at all location on Hurihittu and Vermicelli (Fig. 5). Further, the cigarette beetle was not found on Chakali, Sandige and Papad.

There is no published information on the occurrence of this pest on ragi value products to discuss.

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