

Effect of Seasons on Grain Infestation and Biochemical Composition of Stored Wheat in Western Rajasthan

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Abstract: Studies conducted during 1997-99 on the seasonal effect on grain infestation and biochemical composition of grains revealed that the total infestation of grains due to *Rhizopertha dominica* (Fab.), *Trogoderma granarium* Everts, *Sitotroga cerealella* (Oliver), *Tribolium castaneum* (Herbst) and *Sitophilus oryzae* Linn. was lowest (6.36%) during June-July with a mean protein and alcoholic acidity of 11.72 and 0.083%, respectively. The grain infestation increased to 21.17% during September-October and reduced protein content of the grain to 8.23% and increased the alcoholic acidity to 0.097%. The infestation declined to 12.61% in January-February and caused slight increase in the protein (9.00%), but did not influence alcoholic acidity of the grains.

Key words: Season, grain infestation, biochemical composition, stored wheat.

The food grains are likely to be attacked by different species of stored grain insect pests. The insect infestation, not only leads to yield losses but also reduces the germination, and alter the chemical composition of grain (Bains *et al.*, 1976; Agrawal *et al.*, 1981; Punia *et al.*, 1992). Numerous studies have shown that insect infestation in wheat adversely affect the nutritive value of the grains (Singh *et al.*, 1992; Singh and Yadav, 1995). However, no attempt so far has been made to establish a relationship between grain infestation and biochemical composition of grains. Information on the seasonal effect on the biochemical composition of grains is also not available. The present investigation was, therefore, undertaken to investigate the effect of season and grain infestation on the protein content and alcoholic acidity of grains.

Materials and Methods

Wheat samples were collected during June-July, September-October and January-February 1997-99 from Pali, Jodhpur and Jalore districts of Rajasthan. In each district five villages were selected and from each village the samples were collected from five farmers selected randomly. Thus, twenty-five samples were collected from each district and in all seventy-five samples were drawn from three districts.

The grain infestation caused by rice weevil, *Sitophilus oryzae* Linn., the lesser grain borer, *Rhizopertha dominica* (Fab.), the khapra beetle, *Trogoderma granarium* Everts, the angoumois grain moth, *Sitotroga cerealella* (Oliver) and rust red flour beetle, *Tribolium castaneum* (Herbst), was calculated by counting the number of

Table 1. Biochemical changes in grains of stored wheat during different surveys in three districts of western Rajasthan

District	Surveys	Grain infestation	Biochemical changes (%)	
			Protein	Alcoholic acidity
Pali	1st (June-July)	8.80 (17.26)	10.50 (18.91)	0.09 (1.72)
	2nd (Sept.-Oct.)	32.40 (34.70)	7.05 (15.34)	0.10 (1.81)
	3rd (Jan.-Feb.)	17.00 (24.35)	8.21 (16.64)	0.09 (1.72)
Jodhpur	1st (June-July)	6.00 (14.18)	11.75 (20.00)	0.08 (1.62)
	2nd (Sept.-Oct.)	19.00 (25.84)	8.65 (17.05)	0.10 (1.81)
	3rd (Jan.-Feb.)	12.60 (20.79)	8.81 (17.26)	0.10 (1.81)
Jalore	1st (June-July)	4.20 (11.83)	12.91 (21.05)	0.08 (1.62)
	2nd (Sept.-Oct.)	12.20 (20.44)	9.00 (17.46)	0.09 (1.72)
	3rd (Jan.-Feb.)	8.60 (17.05)	10.01 (18.44)	0.10 (1.81)
	SEm±	2.60	0.703	0.034
	CD at 5%	7.48	2.02	0.10

Values in parenthesis are angular transformed values of percentage.

damaged grains in each representative sample of 500 grains.

The nitrogen content of the grains, determined by micro-kjeldhal-method, was converted into protein content by multiplying with a factor of 5.7 (AOAC, 1970). The alcoholic acidity was estimated by ISI method number 115-1968 (Anonymous, 12968).

Results and Discussion

The data revealed that protein content and alcoholic acidity of wheat grains varied with the infestation (Tables 1 and 2).

The protein content of the grains was highest during June-July, when the infestation was lowest in all three districts. The protein content during this period was 10.5, 11.7 and 12.9% and the respective value of grain infestation was 8.8, 6.0 and 4.2% in Pali, Jodhpur and Jalore districts, respectively. During September-October when the infestation was higher, i.e., 32.4, 19.0 and 12.2%, the protein content was 7.0, 8.6 and 9.0%, in Pali, Jodhpur and Jalore districts,

respectively. During January-February when the infestation was comparatively lower than that of September-October, the protein content of the grains increased. During January-February, in Pali, Jodhpur and Jalore the infestation was 17.0, 12.6 and 8.6%, the respective value of protein content was 8.2, 8.8 and 10.0%. A significant decrease in the protein content of the wheat grains was recorded as the grain infestation increased. The protein content of the wheat grains during June-July was significantly higher than that recorded during September-October and January-February. However, no significant difference was recorded in the protein content of the grains during January-February and September-October.

In Pali, no significant difference in alcoholic acidity was found in the samples collected during three surveys. In Jodhpur, the alcoholic acidity during September-October and January-February was 0.1% which was significantly higher than the alcoholic acidity of wheat samples collected during June-July (0.08%). Similar results

Table 2. Mean infestation, protein content and alcoholic acidity in grains of stored wheat during different surveys in western Rajasthan

Surveys	Infestation (%)	Protein (%)	Alcoholic acidity (%)
1st (June-July)	6.36	11.72	0.083
2nd (Sept.-Oct.)	21.17	8.23	0.097
3rd (Jan.-Feb.)	12.61	9.01	0.097

were also recorded in Jalore district where the lowest alcoholic acidity (0.08%) of the wheat sample was recorded in June-July and highest (0.10%) in January-February. The alcoholic acidity of the wheat samples during September-October was 0.097% which was at par to January-February. Not much variation in alcoholic acidity was recorded among different surveys. The data revealed that irrespective of districts, it was 0.083% during June-July and 0.097% during September-October and January-February (Table 2).

In the present investigation it was found that during September-October protein content of the grains decreased as the infestation increased, whereas the alcoholic acidity increased. The decrease in protein content due to infestation may be attributed to the fact that germ portion of the grain, which contain 25.2% of the total protein, is eaten by the insect.

The present finding is in conformity with the finding of Girish *et al.* (1975). They reported that grain protein decreased with the increase in number of damaged grains. The protein content was 12.2% in undamaged grains as against 8.7% in damaged grains.

Hira *et al.* (1988) inferred that more the insect infestation, higher was the level of alcoholic acidity. Punia *et al.* (1992) observed that first three months of storage

caused significant decrease in protein content in the wheat and there after it remained unaffected in the next three months. An additional three months of storage caused significant decrease in protein content. Singh *et al.* (1992) reported that grain stored in traditional stores, viz., gunny bag and *kachii kothi* had higher level of FFA and alcoholic acidity because of higher insect infestation.

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