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DEVELOPMENT AND DAMAGE POTENTIAL OF *Sitotroga cerealella* (Olivier) (Lepidoptera: Gelechiidae) TO DIFFERENT INDIGENOUS AROMATIC PADDY VARIETIES

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ABSTRACT

The study was aimed to find the reaction of a major insect pest of stored paddy *viz*., Angoumois grain moth *Sitotroga cerealella* (Olivier) (Lepidoptera: Gelechiidae) to different indigenous aromatic paddy varieties. The grains of 11 paddy varieties commonly grown in Terai region of West Bengal (India) were evaluated in May-September in 2011 and 2012. The results showed that the insect completed four generations during the period. The favourable season for the development of *S. cerealella* was May-July when it takes only 29.17-35.21 days to complete the generation. The insect development was significantly fast in paddy variety 'Gobindobhog', 'Kolajoha-small' and 'Mohanbhog' (33.33, 34.35 and 34.59 days) and caused higher damage to grain number (5.05-6.51%) and weight (3.76-4.44%). The insect development was prolonged in paddy cv. 'Tulaipanji' (36.23 days) with less damage to grain number (2.99%) and weight (1.98%). All the developmental stages showed significantly negative relation with temperature but significant positive relation with relative humidity.

Key words: Damage, development, paddy, *Sitotroga*, susceptibility

INTRODUCTION

Prior to the advent of Green Revolution Indian farmers used to cultivate more than one indigenous rice variety in their fields to suit their land, taste, value addition and cultural preferences. An unofficial estimate showed that more than 70 aromatic varieties were in vogue in different agro-climatic zones of West Bengal. Green revolution has been a major single factor responsible for the erosion of these heirloom varieties (Deb, 2005). However, at present only 12-15 IARVs (indigenous aromatic rice varieties) are cultivated in some scattered pockets of various districts in West Bengal (India) in an unorganized manner (Adhikari, 2012; Adhikari*et al*., 2011, 2013). A number of scented and non-scented farmer's varieties of rice are available in India, especially in north-eastern states (Talukdar *et al*., 2012; Chakravorty and Ghosh, 2013). Many patches of West Bengal and Assam are endowed with non-basmati rice cultivars that have been cultivated casually, as way of life with almost no bent towards their commercial exploitation (Roy *et al*., 2013). The farmers store more than 65% of total produced rice till next season for food, feed and seed purposes. In *kharif* (2013), the area under aromatic rice was expanded to 2,000ha, excluding the 50 ha area under aromatic rice seed production in West Bengal (Yadav *et al*., 2014).

Insect pests damage different types of stored grains including rice inflicting serious loss to the national economy. Among them Angoumois grain moth *Sitotroga cerealella* (Olivier) (Lepidoptera: Gelechiidae) is cosmopolitan in distribution. Its young larvae bore into grains and feed on the inside contents rendering grains unfit for human consumption. It is the most serious pest injurious to rice both in field and store (Prakash *et al.*,2004, Rai *et al.*, 2011, Sangeetha *et al.*, 2013) and displays affinity for rice varieties with different levels of resistance (Rizwana *et al.*, 2011). This moth also attacks other cereals like maize, wheat and sorghum. The infestation may reach serious level before the grains are transported to storage godowns resulting in about 25% loss in weight and seed viability. Young larvae bore into grains and tunnel inside the kernel causing substantial damage and rendering the grain more susceptible to secondary insect pests (Weston and Rattlingourd, 2000). The damage caused by the insect ranges from 0.43 to 6.18% in rice (Khanam *et al.,* 1993; Uttam *et al.,* 2002; Rai *et al.,* 2012), 5 to 16.6% in wheat (Chatterjii, 1953), 4.0 to 47.9% in stored maize (Pathak and Jha, 2003). Khan (1991) reported loss of about 15% rice in storage in Bangladesh. Shafique and Ahmad (2003) found such losses in rice in Pakistan ranging from 4.09 to 12.61%. Prakash and Rao (1985) reported that in India most aromatic rice varieties are susceptible and highly susceptible to storage insects. Prakash and Rao (1993) opined that the reactions of aromatic rice varieties to *S. cerealella* in storage have been least known in storage entomology. In Terai region of West Bengal no such work has been reported regarding the response of aromatic paddy varieties to storage insect-pests. Therefore, present study was aimed to assess the susceptibility/ resistance response of indigenous aromatic paddy varieties (farmer’s varieties) to *S. cerealella* under stored conditions.

MATERIALS AND METHODS

Studies on development and extent of damage caused by *S. cerealella* to the various indigenous paddy varieties were conducted in 2011 and 2012 in the Department of Agricultural Entomology, UBKV, Pundibari, West Bengal (India). The grains of 11 paddy varieties commonly grown in Terai region of West Bengal namely Badshabhog, Kolajoha-small, Kalojeera, Mohanbhog, Khasa, Gobindobhog, Kolajoha-big, Tulaipanji, Kalonunia, Chinakamani and Kagaui were collected from the Department of Seed Science & Technology, UBKV, Pundibari, West Bengal (India).

The experimental was conducted in a randomized complete block design with each treatment replicated three times. The grains of test varieties were thoroughly cleaned to remove dirt and inert matter. They were disinfected in hot air oven at 60^0C for 2 h and stored in 100 mL plastic jars under laboratory conditions. The parent culture of *S. cerealella* was maintained in the Department of Agricultural Entomology, UBKV, Pundibari (India). Two pairs of freshly emerged adults were released in each plastic jar with 20 g healthy seeds. The adults were removed after completion of oviposition i.e. after the death of moths. The duration of different biological parameters like incubation period, larval-pupal period and total life span were recorded separately for each variety. The incubation period was assessed on the basis of time taken for egg laying and the time taken for larva emergence from a particular egg. As it passed the larval-pupal stage within the grain; therefore, it was difficult to take observation of larval and pupal periods separately. Hence, larval and pupal periods were counted together and described as mean development period (MDP) and calculated by using the formula suggested by Howe (1971). The total duration from egg to adult life was recorded to count the duration of life cycle. The losses (number and weight) were converted into percentage with the formula:

$$NL\ (\%) = (NG-DN) \times 100 / NG$$

Where, NL: Number of grain loss, NG: Total number of grains and DN: number of damaged grains.

$$\% WL = (IW-FW) \times 100 / IW$$

Where, WL = weight loss, IW = initial weight, and FW = final weight.

Susceptibility index (SI) was calculated by the formula of Dobie (1977)

$$S.I. = \text{Natural log 'F'} \times 100/D$$

Where, F = total number of moths emerged, D = mean development period in days.

The physical parameters of the varieties *viz.*, weight of 100-grains, thickness of grain and length and breadth ratio were estimated. The grain length, width and thickness were measured with a slide calipers. Two-years data was pooled and analyzed statistically. The analysis of variance was performed using Proc GLM command of SAS to compare biological parameters with two fixed factors (variety and generation). The correlation of the infestation level caused by different insect-pests with yield attributing parameters was analyzed. Entire statistical analysis was done using Statistical Analysis Systems (SAS) software (version 9.2).

RESULTS AND DISCUSSION

Under laboratory conditions, *Sitotroga cerealella* completed 4 generations from May to September. All the developmental stages of insect varied significantly in varieties over different seasons. The incubation period was longer (6.15 days) during July-August at 27.9-34.3°C and 78.3-99.0%RH and shorter (5.82 days) in June-July at 26.8-35.3°C and 78.0-99.0% RH (Table 1). Our resulted are supported by Manojlovic (1987) and Rai *et al.* (2011). The embryonic development was prolonged in cv. Kalonunia (6.45 days) followed by 6.39 days in cv. Gobindobhog and 6.30 days in cv. Kagaui. The development was significantly fast in cv. Kolajoha-small (5.63 days) and cv. Kolajoha-big and Tulaipanji with an average of 5.70 days.

The mean development period (MDP) varied significantly within varieties over seasons (Table 1). Significantly longest larval-pupal period (33.43 days) was recorded in August-September at 28.75-35.36°C temperature and 76.65-98.97% RH; whereas shortest period of 21.8 days was recorded in June-July at 28.65-34.93°C temperature and 86.15-99.00% RH followed by 23.13 days at 24.59-34.34°C temperature and 74.48-98.00% RH, respectively, as prevailed during May-June. The MDP was recorded 26.35 days during July-August. Rai *et al.* (2011) recorded 28.92 days of MDP during post-monsoon months. The difference might be due to the varieties taken in two experiments. Akter (2013) observed the population of pest reached peak during July-August which corroborates our findings. Saikia *et al.* (2014) reported 29.25 days of larval-pupal period at 31±10°C and 90±50% RH. The interaction between varieties and seasons revealed shortest MDP in cv. Kolajoha-small (21.80 days) during May-June; in Khasa (19.72 days) during June-July; in Kalonunia (24.11 days) during July-August and in Gobindobhog (26.82 days) during August-September. Irrespective of seasons the development was faster in cv. Gobindobhog (23.74 days) and significantly longest in cv. Badshabhog (27.29 days) and Tulaipanji (27.25 days).

The shortest period of life cycle was recorded during June-July (30.88 days) at 27.71-35.57°C and 79.6-99.0% RH, closely followed by May-June (32.71 days) at 24.11-35.69°C and 60.77-98.33%RH and longest in August-September (72.64 days) at 28.93-36.59°C and 74.14-99.00%RH. The insect completed generation faster on cv. Gobindobhog (33.33 days) and the period was significantly prolonged on Badshabhog (36.64 days). Rai *et al.* (2011) reported that the life cycle duration of *S. cerealella* ranged from 32.65 to 98.86 days in different rice varieties in different seasons in Terai region of West Bengal. Generation and variety interaction showed that the period was shortest (29.17 days) in cv. Gobindobhog in June-July generation and duration was significantly longest in cv. Badshabhog in August-September generation (48.07 days).

The damage both in number and weight of grains occurred due to the infestation of *S. cerealella* were observed significantly more on Kolajoha-small (6.51 and 4.44% in number and weight) (Table 2).

Table 1: Duration of developmental stages of *Sitotroga cerealella* on different paddy varieties (mean of 2011 and 2012)

Paddy variety	Egg					Mean development period					Life cycle				
	May-June	June-July	July-Aug	Aug-Sep	Mean	May-June	June-July	July-Aug	Aug-Sep	Mean	May-June	June-July	July-Aug	Aug-Sep	Mean
Badshabhog	5.85	5.70	6.35	5.98	5.97	22.96	21.16	25.78	39.23	27.29	33.17	30.17	35.17	48.07	36.64
	(2.52)	(2.49)	(2.62)	(2.55)	(2.54)	(4.84)	(4.65)	(5.13)	(6.30)	(5.27)	(5.80)	(5.54)	(5.97)	(6.97)	(6.09)
Kolajoha small	5.42	5.34	6.01	5.75	5.63	21.80	23.12	25.55	31.19	25.41	31.85	30.70	34.61	40.24	34.35
	(2.43)	(2.42)	(2.55)	(2.50)	(2.48)	(4.72)	(4.86)	(5.10)	(5.63)	(5.09)	(5.69)	(5.59	(5.93)	(6.38)	(5.90)
Kalojeera	6.11	5.54	5.96	6.02	5.91	22.70	21.94	26.71	35.78	26.78	32.17	30.82	35.72	44.96	35.92
	(2.57)	(2.46)	(2.54)	(2.55)	(2.53)	(4.82)	(4.74)	(5.22)	(6.02)	(5.22)	(5.72)	(5.60)	(6.02)	(6.74)	(6.03)
Mohanbhog	5.92	5.73	5.82	6.10	5.89	22.31	21.14	30.16	28.76	25.59	31.32	30.00	39.00	38.04	34.59
	(2.53)	(2.50)	(2.51)	(2.57)	(2.53)	(4.78)	(4.65)	(5.54)	(5.41)	(5.11)	(5.64)	(5.52)	(6.28)	(6.21)	(5.92)
Khasa	6.10	6.30	6.23	6.30	6.23	24.30	19.72	25.10	35.47	26.15	33.62	29.26	34.35	44.95	35.55
	(2.57)	(2.61)	(2.60)	(2.61)	(2.59)	(4.98)	(4.50)	(5.06)	(6.00)	(5.16)	(5.84)	(5.46)	(5.90)	(6.74)	(6.00)
Gobindobhog	6.40	6.20	6.65	6.32	6.39	22.63	19.86	25.64	26.82	23.74	32.49	29.17	35.31	36.34	33.33
	(2.63)	(2.59)	(2.67)	(2.61)	(2.63)	(4.81)	(4.51)	(5.11)	(5.23)	(4.92)	(5.74)	(5.45)	(5.98)	(6.07)	(5.82)
Kolajoha big	5.93	5.59	5.77	5.52	5.70	22.26	22.02	25.26	36.85	26.60	31.44	32.10	34.08	45.38	35.75
	(2.54)	(2.47)	(2.50)	(2.45)	(2.49)	(4.77)	(4.75)	(5.08)	(6.11)	(5.21)	(5.65)	(5.71)	(5.88)	(6.77)	(6.02)
Tulaipanji	5.89	5.63	5.72	5.56	5.70	24.32	24.11	30.40	30.16	27.25	33.64	32.99	39.13	39.17	36.23
	(2.53)	(2.48)	(2.49)	(2.46)	(2.49)	(4.98)	(4.96)	(5.56)	(5.54)	(5.27)	(5.84)	(5.79)	(6.30)	(6.30)	(6.06)
Kalonunia	6.40	6.32	6.70	6.36	6.45	25.63	22.84	24.11	29.90	25.62	35.21	30.99	33.83	39.42	34.86
	(2.63)	(2.61)	(2.68)	(2.62)	(2.64)	(5.11)	(4.83)	(4.96)	(5.51)	(5.11)	(5.98)	(5.61)	(5.86)	(6.32)	(5.95)
Chinnakumari	6.35	5.60	6.10	6.31	6.09	23.50	22.33	25.64	35.95	26.86	33.15	31.33	34.79	45.26	36.13
	(2.62)	(2.47)	(2.57)	(2.61)	(2.57)	(4.90)	(4.78)	(5.11)	(6.04)	(5.23)	(5.80)	(5.64)	(5.94)	(6.76)	(6.05)
Kagui	6.37	6.09	6.37	6.37	6.30	22.00	21.54	25.45	37.63	26.65	31.70	32.16	34.85	47.19	36.47
	(2.62)	(2.57_	(2.62)	(2.62)	(2.61)	(4.74)	(4.69)	(5.09)	(6.17)	(5.21)	(5.67)	(5.72)	(5.95)	(6.91)	(6.08)
Mean	6.07	5.82	6.15	6.05	6.02	23.13	21.80	26.35	33.43	26.18	32.71	30.88	35.53	42.64	35.44
	(2.56)	(2.51)	(2.58)	(2.56)	(2.55)	(4.86)	(4.72)	(5.18)	(5.81)	(5.16)	(5.76)	(5.60)	(6.00)	(6.56)	(5.99)

Figure in parenthesis represents square root transformed values

Anova

		Egg				Mean development period				Life cycle			
Source	DF	Type III SS	Mean square	F value	Pr > F	Type III SS	Mean square	F value	Pr > F	Type III SS	Mean square	F value	Pr > F
Variety	10	0.389	0.039	23.03	<.0001	1.0944	0.1094	1.18	0.3182	0.8016	0.0802	1.18	0.3185
Season	3	0.073	0.024	14.44	<.0001	23.4791	7.8264	84.06	<.0001	17.4788	5.8263	85.41	<.0001
Var x gen	30	0.110	0.004	2.16	0.0029	4.9331	0.1644	1.77	0.0215	3.4261	0.1142	1.67	0.0335
Var x gen	30	36.5689	1.2189	1.94	0.0091	28.2875	0.9429	5.49	<.0001	2.06628	0.0688	1.48	0.0819

Var = Variety; gen = Generation

The damage in grain number was lowest in Tulaipanji (2.99%) while damage in weight was lowest in long slender Tulaipanji (1.98%). Rai *et al.* (2012) recorded highest damage in short bold and lowest in long slender varieties. The damage was maximum during June-July (5.38%) in number and May-June (3.93%) in weight of grains. The results are in conformity with Cogburn and Vick (1981), Bitran *et al.* (1978) and Rai *et al.* (2012) who reported maximum losses in warmer months. The damage was less during August-September in both numbers (3.14%) and weight (2.09%). Reports reveal that the damage caused by the insect ranges from 0.43 to 6.18% in rice (Khanam *et al.*, 1993, Uttam *et al.*, 2002; Rai *et al.*, 2012) so support our findings. Uttam *et al.* (2002) reported that the extent of damaged grain had significant positive correlation with percent loss in weight. Rizwana *et al.* (2011) reported positive and highly significant correlation between the number of moths emerged and percent weight loss (r = 0.780) and percent damage (r = 0.882).

The susceptibility index was maximum 7.54 in Kolajoha-small and minimum in Tulaipanji (4.91). In respect to season it was significantly higher (7.39 ranged from 6.16 to 9.10) during June-July and lowest during August-September (3.74 ranged from 2.23 to 5.83).

Table 2: Extent of damage to different paddy varieties caused by *S. cerealella* (mean of 2011-2012)

Paddy varieties	Damage in number of grain (%)					Damage in weight of grain (%)					Susceptibility index (SI)				
	May-June	June-July	July-Aug	Aug-Sep	Mean	May-June	June-July	July-Aug	Aug-Sep	Mean	May-June	June-July	July-Aug	Aug-Sep	Mean
Badshabhog	2.85	4.81	4.85	3.15	3.92	2.02	4.04	3.90	2.35	3.08	6.12	7.59	6.52	3.12	5.84
	(9.72)	(12.68)	(12.72)	(10.22)	(11.41)	(8.17)	(11.60)	(11.39)	(8.81)	(10.10)					
Kolajoha small	5.21	7.82	8.31	4.70	6.51	4.94	4.36	5.18	3.31	4.44	7.86	9.10	7.38	5.83	7.54
	(13.19)	(16.24)	(16.75)	(12.52)	(14.78)	(12.84)	(12.05)	(13.15)	(10.48)	(12.17)					
Kalojeera	5.94	5.98	4.23	2.51	4.66	5.30	4.22	2.72	1.87	3.53	7.34	7.30	5.72	3.12	5.87
	(14.10)	(14.15)	(11.86)	(9.11)	(12.47)	(13.30)	(11.85)	(9.50)	(7.86)	(10.82)					
Mohanbhog	6.06	9.79	4.35	4.03	6.06	5.52	6.66	2.25	2.59	4.26	7.77	8.76	4.98	5.26	6.69
	(14.25)	(18.23)	(12.04)	(11.58)	(14.25)	(13.58)	(14.96)	(8.64)	(9.26)	(11.90)					
Khasa	3.32	5.22	4.66	2.82	4.00	2.92	3.76	2.59	1.71	2.75	5.56	8.12	5.62	2.84	5.53
	(10.50)	(13.20)	(12.47)	(9.66)	(11.54)	(9.84)	(11.19)	(9.27)	(7.51)	(9.54)					
Gobindobhog	4.66	5.27	6.58	3.69	5.05	3.46	4.70	4.40	2.47	3.76	7.24	8.27	6.49	4.79	6.70
	(12.46)	(13.27)	(14.87)	(11.07)	(12.98)	(10.72)	(12.52)	(12.11)	(9.04)	(11.18)					
Kolajoha big	4.80	5.06	6.40	3.21	4.87	3.82	3.29	4.73	2.36	3.55	7.07	7.06	6.75	3.60	6.12
	(12.66)	(13.00)	(14.66)	(10.32)	(12.75)	(11.28)	(10.44)	(12.56)	(8.84)	(10.86)					
Tulaipanji	3.86	3.19	2.37	2.53	2.99	3.65	1.53	1.32	1.42	1.98	6.19	5.83	4.17	3.47	4.91
	(11.34)	(10.28)	(8.85)	(9.15)	(9.95)	(11.01)	(7.10)	(6.60)	(6.84)	(8.09)					
Kalonunia	4.04	4.13	4.65	3.10	3.98	2.58	3.47	3.24	2.22	2.88	5.81	6.74	6.94	3.88	5.85
	(11.60)	(11.72)	(12.45)	(10.13)	(11.51)	(9.24)	(10.73)	(10.37)	(8.56)	(9.77)					
Chinnakumari	5.66	3.04	4.57	2.51	3.94	4.92	1.87	3.23	1.69	2.93	7.32	6.37	6.22	3.06	5.74
	(13.76)	(10.04)	(12.34)	(9.11)	(11.45)	(12.82)	(7.86)	(10.35)	(7.47)	(9.85)					
Kagui	4.72	4.87	4.15	2.29	4.01	4.10	3.35	2.73	1.03	2.80	6.43	6.16	5.02	2.23	4.96
	(12.55)	(12.75)	(11.76)	(8.70)	(11.55)	(11.68)	(10.55)	(9.51)	(5.82)	(9.64)					
Mean	4.65	5.38	5.01	3.14	4.54	3.93	3.75	3.30	2.09	3.27	6.79	7.39	5.98	3.74	5.98
	(12.45)	(13.41)	(12.93)	(10.21)	(12.31)	(11.43)	(11.17)	(10.47)	(8.31)	(10.41)					

Figure in parenthesis represents angular transformed values

Anova

		Grain%				Weight%				Susceptibility Index			
Source	DF	Type III SS	Mean Square	F Value	Pr > F	Type III SS	Mean Square	F Value	Pr > F	Type III SS	Mean Square	F Value	Pr > F
Variety	10	41.8861	4.1886	6.66	<.0001	20.5061	2.0506	11.94	<.0001	2.9006	0.2900	6.23	<.0001
Season	3	31.5995	10.5331	16.75	<.0001	22.3002	7.4334	43.29	<.0001	11.12911	3.7097	79.68	<.0001
Var x gen	30	36.5689	1.2189	1.94	0.0091	28.2875	0.9429	5.49	<.0001	2.06628	0.0688	1.48	0.0819

Var = Variety; gen = Generation

All the developmental stages showed significant and negative correlation with temperature and significant and positive relation with RH (Table 3). Rodriguez (1982), Mendoza *et al.* (2004) and Rai *et al.* (2011) also reported the same. Akter (2013) opined that the highest population increase of *S. cerealella* occurred at 30°C. High relative humidity and temperatures higher than 30°C are not conducive for the development of this pest (Hansen *et al.*, 2004). The relative humidity played significant role in the development of insect during August-September while temperature showed significant effect on the insect during June-August. Correlation studies revealed that the damage of grain both in number and weight as well as susceptibility index had negative correlation with mean development period and life cycle duration in all the generations (Table 4).

Table 3: Correlation of temperature and relative humidity with the development of *S. cerealella*

	Incubation				Larva-pupa				Life cycle			
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Max temp	-0.887*	-0.408	-0.229	-0.186	-0.481*	-0.542*	-0.645*	-0.962*	-0.609*	-0.293	-0.409	-0.909*
Min temp	-0.177	-0.108	-0.201	-0.387	-0.150	-0.550*	-0.643*	-0.274	-0.169	-0.211	-0.428	-0.569*
Avg temp	-0.867*	-0.274	-0.240	-0.298	-0.489*	-0.666*	-0.655*	-0.896*	-0.789*	-0.307	-0.508*	-0.878*
Max. RH	0.395	0.468*	0.424	0.554*	0.502*	0.521*	0.364	0.966*	0.271	0.368	0.224	0.959*
Min. RH	0.187	0.625*	0.604*	0.525*	0.192	0.211	0.201	0.933*	0.254	0.327	0.162	0.919*
Avg RH	0.234	0.676*	0.618*	0.536*	0.775*	0.503*	0.522*	0.934*	0.358	0.377	0.352	0.920*

Table 4: Correlation between developments of *S. cerealella* with their damage potential (%) and susceptibility index (SI)

Parameters	1st generation			2nd generation			3rd generation			4th generation		
	Egg	MDP	Life cycle	Egg	MDP	Life cycle	Egg	MDP	Life cycle	Egg	MDP	Life cycle
No. of grains	0.032	-0.457	-0.582	-0.236	-0.246	-0.441	0.160	-0.514	-0.544	-0.215	-0.530	-0.555
Wt of grains	-0.173	-0.513	-0.642	0.065	-0.529	-0.675	0.239	-0.628	-0.656	-0.275	-0.396	-0.431
S.I	-0.307	-0.705	-0.725	-0.096	-0.462	-0.777	0.392	-0.741	-0.754	-0.223	-0.751	-0.775

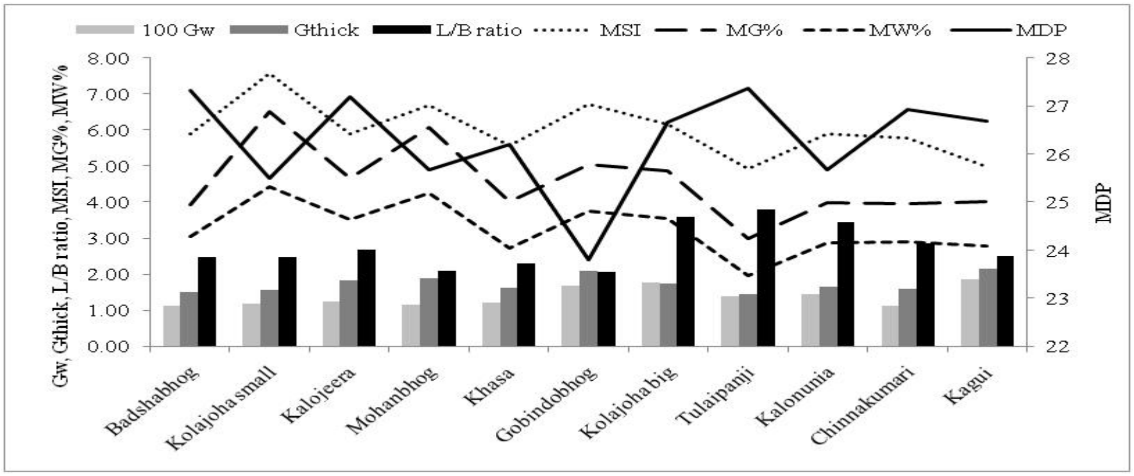

Fig. 1: Correlation between physical parameters of the paddy varieties and development and damage potential of *S. cerealella;* GW = grain weight (g), Gthick = grain thickness (mm), L/B ratio = length-breadth ratio, MSI = mean susceptibility index, MG = mean damaged grain in number, MW = mean damaged grain in weight, MDP = mean developmental period (days)

From overall observations, it appears that the favourable season for the development of *S. cerealella* is May-July in Terai region of West Bengal where it takes only 29.17-35.21 days to complete the generation. The optimum climatic conditions for *Sitotroga* development are 20.95-31.53°Cand 57.2-99.0%RH. Considering the development and damage, the short bold varieties like Kolajoha-small, Gobindobhog and Mohanbhogare the most preferred and long slender Tulaipanji are unfavourable for *S. cerealella* infestation among the indigenous aromatic varieties tested.

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