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S Vijay
Department of Agricultural Entomology, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

K Bhuvaneswari
Department of Agricultural Entomology, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Correspondence
S Vijay
Department of Agricultural Entomology, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Effect of temperature on oviposition and development of *Sitophilus oryzae* L. feeding on split pulses

S Vijay and K Bhuvaneswari

Abstract

An experiment was carried out at the Entomology Laboratory, Horticultural College and Research Institute for Women, Trichy in February to March 2014 to study the oviposition and development of *Sitophilus oryzae* L. under room and controlled conditions. Observations were made on oviposition rate, total number of eggs, adult emergence per 100 grains, egg to adult survival percentage, adult longevity, adult emergence period and reproductive potential. The oviposition rate per female (14.38 nos), total number of eggs (143.75 nos), adult emergence per 100 grains (69.00 nos), egg to adult survival percentage (50.89), female longevity (13.80 weeks), male longevity (9.80 weeks) and reproductive potential (48.50 nos),were higher in redgram under room temperature feeding by the respective population as compared to controlled conditions. In case of sorghum, all the above parameters were superior to redgram feeding by the respective population under room and controlled temperature conditions.

Keywords: Oviposition and development, *Sitophilus oryzae* L., split pulses

1. Introduction

The rice weevil, *Sitophilus oryzae* (L.) (Coleoptera: Curculionidae), is one of the most destructive pest of stored cereals worldwide. It is classed as a primary pest, cosmopolitan in nature and is known to infest sound cereal seeds (Hill, 1990) [1] and causes severe loss in rice, maize, barley and wheat (Neupane, 1995) [2]. Though the storage grain loss is caused by insect pests, pathogens and rodents it is generally believed that half of the storage loss is usually caused by insects. Considering the loss caused by storage insect pests, effective methods of control are of paramount importance. Control often depends on a sound knowledge of the ecology and on the effects of a multitude of environmental factors on the life history of a pest (Latha and Naganagoud, 2015) [3].

Reports about its occurrence on legumes are scanty. Pemberton *et al* (1981) [4] studied its breeding behaviour on carob, *Ceratonia siliqua* (L.), a tree legume native to the Mediterranean region. Coombs *et al.* (1977) [5] reported the successful development by Trinidad strain of *S. oryzae* on yellow split pea. In India, the pest was recorded for the first time to feed on red gram at Coimbatore. We collected a population of rice weevil feeding on split red gram dhal was sent to IARI, identified as *Sitophilus oryzae* by Dr. V.V. Ramamoorthy, Principal Scientist, Entomology Division. Keeping in this view, the present study to observe the oviposition and development of pulse breeding population of *S. oryzae* were studied in comparison to normal population that occurs on sorghum under two difference temperature conditions.

2. Materials and Methods

An experiment was carried out at the Entomology Laboratory, Horticultural College and Research Institute for Women, Trichy in February to March 2014 to study the oviposition and development of redgram breeding *Sitophilus oryzae* L. population in compare to that of sorghum breeding population under room and controlled conditions.

2.1 Mass culturing of rice weevil

Adult weevils were released into the culture media namely sorghum and split redgram dhal for oviposition. From this infested stock a sub sample containing 100 grains was taken starting from 5 days after oviposition. The sex of one week old adult was determined by examining the rostrum and the mated females were used for oviposition studies.

2.2 Biology and developmental studies of rice weevil
Each female was placed in 5 x 3.5 cm plastic bottles with 10 grains of sorghum/split pulses and closed with a perforated plastic lid. Each female was then transferred at an interval of 2 days to a new vial containing 10 fresh grains and the process was continued for two weeks. The grains were then examined under the microscope for the gelatinous egg plugs. The grains were totally collected in a separate plastic container and observed for the oviposition rate, total number of eggs laid, adult emergence per 100 grains and percentage of survival from egg to adult (Shazali and Smith, 1985) [6].

The adult longevity was assessed for both male and female by maintaining them separately from the day one of emergence. The studies were carried out using sorghum and split pulses *viz.*, red gram, chick pea, black gram, green gram, fried gram and lentil as hosts.

In order to estimate the developmental period and reproductive potential, a group of 15 females (one week old) were placed in 7.5 x 2.5 cm plastic containers each containing 6 g (about 200 grains) of sorghum/ split pulses and allowed to oviposit for 24 hrs. Beginning 25 days after the start of the experiment, each vial was checked daily for adults, which were removed and counted.

The longevity of isolated adults was determined by transferring seven day old adult weevils from a culture into separate glass vials (5 x 2.5 cm). Ten males and ten females were isolated and used for each combination of temperature and humidity. About 3 g of equilibrated sorghum and split pulses were placed in each vial. The vials were checked at weekly intervals and insects were transferred to freshly equilibrated grains every 3 weeks. The experiment was laid out in a completely randomized design (CRD) with seven treatments *viz.*, T_1 = sorghum,
T_2 = split red gram dhal, T_3 = split chick pea dhal, T_4 = split black gram dhal, T_5= split green gram dhal, T_6= split fried gram dhal and T_7= split lentil dhal and each replicated four times. The experiments were conducted under room and controlled conditions and the details are given below

S. No	Month	Room Temperature (ºC) and RH %	Controlled Temperature
1.	February - March 2014	*Ranges from 30.5 to 35.25 for 60 days period, RH range 77-84%	35 ºC, 70 and 80% RH

*The ranges of room temperature was calculated using the formula (Monthly mean temperature= (Maximum temperature + Minimum temperature) /2 for 60 days)

3. Results and Discussion
Oviposition rate, total number of eggs, adult emergence per 100 grains and egg to adult survival percentage of *S. oryzae* were studied at fluctuating room and controlled conditions. At room temperature (30.5 to 35.25 ºC and 77 to 84% RH) the oviposition rate per female was 14.38 in redgram followed by green gram (13.85), chick pea (11.90), lentil (11.53), black gram (9.58) and fried gram (9.08) respectively. Similarly, under controlled condition oviposition rate per female was significantly higher in redgram (11.95 and 10.20) and was on par with green gram (11.85 and 9.65) followed by chick pea (8.30 and 7.00) at 35 ºC, 70 and 80 percent RH (Table 1). The total number of eggs laid was significantly maximum in redgram (143.75) followed by green gram (138.50) under room temperature, whereas in controlled conditions it was higher in redgram (119.50 and 102.00) and was on par with green gram (118.50 and 96.00) followed by lentil (88.75 and 72.00) at 35 ºC, 70 and 80 percent RH (Table 1). In case of sorghum population, the oviposition rate and total number of eggs laid were superior to redgram population feeding on split pulses at both room and controlled temperatures. Shazali and Smith (1985) [6] reported that oviposition rate per female was recorded maximum in sorghum (11.60/female/2 day period) at 30 ºC and 80 percent RH. It might be due to the interaction between temperature and humidity.

Adult emergence per 100 grains was maximum in redgram (69.08)followed by green gram (64.55), chick pea (57.17), lentil (55.92), black gram (30.95)and it was recorded minimum in fried gram (34.67)at room temperature condition (Fig 1). However under controlled conditions it was significantly maximum in redgram (54.05 and 42.00) followed by green gram (50.85 and 36.75), chick pea (32.75 and 26.58) and least in fried gram (20.78 and 9.54) at 35 ºC, 70 and 80 percent RH (Table 2). In case of sorghum population adult emergence per 100 grains was significantly superior to split pulses at room (82.08) and controlled conditions (70.83 and 52.92) respectively. Shazali and Smith (1985) [6] reported that adult emergence per 100 grains was recorded maximum in sorghum (47.30 adults) at 30 ºC and 70% RH, (54.1 adults) at 30 ºC and 80 percent RH. Danho (2001) [7] reported that adult emergence from 100 grain of maize was 49.64 at 30 ºC and 70 percent RH.

Among the split pulses percentage of egg to adult survival was maximum in redgram (50.89), followed by green gram (48.61) and chick pea (47.89) at room temperature (Fig 2). Similarly, in controlled conditions also it was significantly higher in redgram (45.23 and 38.89) followed by green gram (42.91 and 38.28), chick pea (39.46 and 37.97) and was minimum in fried gram (31.69 and 19.87) at 35 ºC, 70 and 80 percent RH respectively (Table 2**)**. In case of sorghum population, percentage of egg to adult survival was higher than that of redgram population feeding on split pulses. This variation in survival of *S. oryzae* might be the influence of different temperature and humidity. Sharifi and Mills (1971) [8] reported that percentage of egg to adult survival were maximum in sorghum (39.40) at 27 ºC, 70 percent RH. Similar results were also found by Richards (1947) [9] and Howe (1952) [10] in *S. oryzae* at different temperature and humidity conditions.

At room temperature (30.5 to 35.25 ºC and 77 to 84% RH) the adult longevity (female) was 13.80 weeks in redgram followed by chickpea (13.63 weeks), green gram (13.23 weeks) and black gram (13.15) were on par with each other. Under controlled conditions it (female) was maximum in redgram (12.85 and 12.10 weeks) on par with green gram (12.73 and 11.98 weeks) and chick pea (12.63 and 11.88 weeks) at 35 ºC, 70 and 80 percent RH (Table 10). It was recorded minimum in lentil at both room (12.43 weeks) and controlled (12.18 and 11.28 weeks) conditions (Table 3**)**. Adult longevity (male) was recorded in redgram, green gram, chick pea and black gram (9.80, 9.80, 9.43 and 9.38 weeks) were on par with each other followed by fried gram (8.00 weeks) and lentil (7.00 weeks) under room temperature condition. Similarly, under controlled conditions, the adult longevity (male) was recorded in redgram (8.63 and 6.95weeks), green gram (8.80 and 6.80weeks), chick pea (8.83 and 6.58 weeks) and black gram (8.93 and 5.68 weeks) were on par with each other followed by fried gram (7.75 and 5.25 weeks) and lentil (6.90 and 5.90 weeks) at 35 ºC, 70 and 80 percent RH (Table 3**)**. In case of sorghum population, adult longevity (female and male) were superior to redgram population feeding on split pulses at both room and controlled conditions.

In present investigation room temperature (30.5 to 35.25 ºC and 77 to 84% RH) was favorable for insect survival and it might be due to the fluctuating weather conditions. The present finding is in accordance with Howe (1952) [10] who reported that mean longevity of 15 weeks for *S. oryzae* in uncontrolled conditions on rice, with no difference between the sexes. Shazali and Smith (1985) [6] reported that mean longevities of isolated adults were significantly longer at 30 °C, 80 percent RH as compared with 70 and 60 percent RH however, male and female longevities were not significantly different. McFarlane (1968) [11] found that the longevity of *S. oryzae* was about 9 weeks at 25 °C and 70 percent RH. Russell (1966) [12] reported that longevity of *S. oryzae* was affected by both temperature and humidity when feeding on sorghum which ranged from 10 and 22 weeks at 28 °C and life span was significantly prolonged by higher humidities (70 and 80% RH). The longevity was greater at lower temperature and higher humidity and there was no evidence of interaction between temperature and humidity were reported by Shazali (1982) [13]. Bheemanna (1986) [14] observed adult longevity ranged from 14 to 165 days and 7 to 11 days with and without food, respectively. The longevity of adult male and female was 14 to 115 and 119 to 120 days, respectively in maize (Bhuiyah *et al.*, 1990) [15] this deviation might be due to change of host and size of the grains.

Among the split pulses reproductive potential was maximum in redgram (48.50), green gram (44.00) and minimum in fried gram (25.75) at room temperature (Fig 3). Similarly under controlled conditions, it was significantly higher in redgram (42.50 and 37.75), green gram (39.75 and 32.83) and least in fried gram (22.25 and 15.25) at 35 ˚C, 70 and 80 percent RH (Table 4**).** The reproductive potential recorded in sorghum by the respective population was significantly higher than that of split pulses at room (66.00) and controlled conditions (61.75 and 49.75). The present findings are in accordance with Shazali and Smith (1985) [6] reported that the temperature and humidity influence reproductive potential, most off spring were produced at 30 °C and 80 percent RH when compared to 30 °C and 70 percent RH

Developmental period was statistically higher in lentil (29.75 days) followed by fried gram (29.50 days) and were on par with redgram (29.00 days) at room temperature. Similarly under controlled conditions, it was higher in lentil (31.00 and 30.38 days) followed by other hosts at 35 ˚C, 70 and 80 percent RH (Table 4**).** However, there was no significant variation in developmental period at controlled conditions. In case of sorghum population, the adult emergence period was 28.00 days at room temperature, whereas in controlled conditions it was 29.50 and 27. 88 days at 35 ºC, 70 and 80 percent RH. In case of sorghum developmental period was minimum when compared to redgram population feeding on split pulses irrespective of temperature and humidity. The difference might be attributed to variation in host and different environment condition (Kamel and Zewar, 1973) [16]. The present findings are in accordance with Shazali and Smith (1985) [6] who reported that total development period was fastest (29.5 days) and the mean number of adult emergence was greatest at 30 °C and 80 percent RH. At 50 percent RH the mean development time was 37.7 days, 3.5 days longer than at 60 percent RH. Kavita Jadhav (2006) [17] reported that total life cycle from egg to adult took 35 to 46 days with an average of 40.2 days. Howe (1952) [23] reported that mean development of egg to adult emergence ranged from 21 to 46 days. Bheemanna (1986) [14] reported 38 to 53 days of total life cycle on sorghum. Deepthi and Manjunatha (2015) [18] reported that developmental period of *S. oryzae* on sorghum was the lowest (28.75±1.3 days) followed by field bean (34.00±0.71 days) and Bengal gram (32.25±0.83 days). The highest developmental period (37.50±1.12 days) was in green gram, where weevil takes more days to complete its life cycle.

Karan Singh *et al*. (1973) [19] studied the oviposition and development of *S. oryzae* in high yielding varieties of wheat at all combinations of the three temperatures *viz.,* 19 ºC, 25 °C and 30 °C and four RHs, 45, 60, 75 and 90 percent. Oviposition and development were best at 75 percent RH in all varieties. Oviposition and development rates were greater at 30 °C and slower at 18 °C than at 25 °C. Of the conditions examined 30 °C and 75 percent RH was the best for oviposition and development of *S. oryzae.*

In present investigation, room temperature was favouarable for insect multiplication, growth and development when compared to controlled condition. This finding is in accordance with McFarlane (1968) [11] who considered the effect of ambient (fluctuating) climatic conditions upon the rate of development of *S. oryzae* in Kenya. The results showed that, for sites with mean temperatures higher than 26 °C, periodic short excursions into the harmful high temperature range may exert a prolonged adverse effect upon development, so that development is slower than would be expected. On the other hand, where sub minimal temperatures were experienced periodically, development was at higher rate than predicted. This might be due to developmental process being initiated by a temperature rise above the minimum and continuing to some extent after the ambient temperature has once more dropped below the minimum.

Table 1: Effect of temperature and relative humidity on oviposition rate and total number of eggs of *S. oryzae* feeding on sorghum and split pulses (February to March)

S. No	Treatments	Oviposition rate* (eggs/female)			Total number of eggs per 100 grains *		
		Room Temperature	35 ºC, 70% RH	35 ºC, 80% RH	Room Temperature	35 ºC, 70% RH	35 ºC, 80% RH
1.	Redgram	14.38±1.00 (3.79)b	11.95±0.58 (3.46)b	10.20±0.53 (3.19)b	143.75±1.53 (11.99)b	119.50±0.58 (10.93)b	102.00±1.53 (10.10)b
2.	Chick pea	11.90±1.53 (3.45)c	8.30±0.06 (2.88)c	7.00±0.32 (2.65)c	119.00±1.00 (10.91)d	83.00±1.53 (9.11)d	70.00±1.00 (8.37)d
3.	Black gram	9.58±0.58 (3.09)d	6.58±1.00 (2.56)c	4.83±0.76 (2.19)d	95.75±1.73 (9.79)f	65.75±1.53 (8.11)e	52.50±0.58 (7.21)f
4.	Green gram	13.85±1.15 (3.72)b	11.85±0.50 (3.44)b	9.65±0.29 (3.10)b	138.50±1.53 (11.77)c	118.50±1.00 (10.89)b	96.00±1.00 (9.80)b
5.	Fried gram	9.08±1.15 (3.01)d	6.53±0.29 (2.55)c	5.20±0.50 (2.28)e	90.75±1.15 (9.53)g	65.25±1.00 (8.08)e	48.40±1.53 (6.93)e
6.	Lentil	11.53±1.00 (3.39)c	8.88±1.15 (2.98)c	7.28±0.25 (2.68)c	115.25±0.58 (10.74)e	88.75±0.58 (9.42)c	72.00±1.00 (8.49)c
7.	Sorghum	16.50±0.29 (4.06)a	14.30±0.50 (3.78)a	11.43±1.15 (3.38)a	165.00±0.58 (12.85)a	143.00±0.76 (11.96)a	114.50±1.53 (10.68)a

*Mean of four replications. Figures in parentheses are square root transformed values. Mean followed by same letter (s) in a column are not significantly different by DMRT (P=0.05). Room temperature ranges from 30.5 to 35.25, RH ranges from 77 to 84%

Table 2: Effect of temperature and relative humidity on adult emerging per 100 grainsand egg to adult survival percentage of *S. oryzae* feeding on sorghum and split pulses (February to March)

S. No	Treatments	Adult emergence per 100 grains*			Egg to adult survival percentage*		
		Room Temperature	35 ºC, 70% RH	35 ºC, 80% RH	Room Temperature	35 ºC, 70% RH	35 ºC, 80% RH
1.	Redgram	69.08±1.00 (8.31)[b]	54.05±1.53 (7.35)[b]	42.00±1.00 (7.68)[b]	50.89±1.15 (45.51)[a]	45.23±0.12 (42.26)[ab]	38.89±1.26 (38.58)[b]
2.	Chick pea	57.17±1.31 (7.56)[d]	32.75±1.73 (5.72)[e]	26.58±1.53 (6.37)[d]	47.89±0.76 (43.79)[c]	39.46±0.58 (38.91)[bc]	37.97±1.08 (38.04)[c]
3.	Black gram	30.95±0.58 (5.56)[f]	22.83±1.00 (4.78)[f]	15.45±0.58 (5.04)[e]	42.44±1.53 (40.65)[e]	34.99±1.00 (36.26)[c]	29.71±1.53 (33.03)[e]
4.	Green gram	64.55±1.73 (8.03)[c]	50.85±0.58 (7.13)[c]	36.75±1.00 (7.47)[c]	48.61±0.58 (44.21)[b]	42.91±1.73 (40.92)[a]	38.28±0.58 (38.22)[b]
5.	Fried gram	34.67±0.50 (5.89)[e]	20.78±1.00 (4.56)[g]	9.54±1.00 (4.75)[f]	36.17±1.15 (36.97)[f]	31.69±1.00 (34.21)[d]	19.87±0.58 (26.48)[f]
6.	Lentil	55.92±0.58 (7.48)[d]	38.08±1.53 (6.17)[d]	25.68±1.53 (6.38)[d]	46.23±0.58 (42.84)[d]	42.91±0.58 (40.92)[b]	35.67±1.15 (36.67)[d]
7.	Sorghum	82.08±1.53 (9.06)[a]	70.83±1.00 (8.40)[a]	52.92±1.53 (8.42)[a]	51.63±1.00 (45.93)[a]	49.53±0.58 (44.73)[a]	46.42±0.76 (42.95)[a]

*Mean of four replications. Figures in parentheses are square root transformed values. Mean followed by same letter (s) in a column are not significantly different by DMRT (P=0.05).#Figures in parentheses are arc sin transformed values. Means followed by same letter (s) in a column are not significantly different by DMRT (P=0.05). Room temperature ranges from 30.5 to 35.25, RH ranges from 77 to 84%

Table 3: Effect of temperature and relative humidity on male and female longevity of *S. oryzae* feeding on sorghum and split pulses (February to March)

S. No	Treatments	Adult female longevity (weeks)*			Adult male longevity (weeks)*		
		Room Temperature	35 ºC, 70% RH	35 ºC, 80% RH	Room Temperature	35 ºC, 70% RH	35 ºC, 80% RH
1.	Redgram	13.80±0.75 (3.58)[b]	12.85±0.62 (3.58)[ab]	12.10±0.69 (3.48)[ab]	9.80±0.08 (3.13)[a]	8.63±0.21 (2.94)[a]	6.95±0.49 (2.64)[a]
2.	Chick pea	13.63±0.22 (3.69)[b]	12.63±0.22 (3.55)[ab]	11.88±0.59 (3.45)[bc]	9.43±0.31 (3.07)[a]	8.83±0.19 (2.97)[a]	6.58±0.32 (2.56)[ab]
3.	Black gram	13.15±0.25 (3.63)[bc]	12.15±0.77 (3.49)[bc]	11.35±0.44 (3.37)[ce]	9.38±0.33 (3.07)[a]	8.93±0.36 (2.99)[a]	5.68±0.25 (2.38)[c]
4.	Green gram	13.23±0.13 (3.64)[bc]	12.73±0.67 (3.57)[ab]	11.98±0.53 (3.46)[bc]	9.80±0.08 (3.13)[a]	8.80±0.08 (2.97)[a]	6.80±0.08 (2.61)[a]
5.	Fried gram	12.50±0.26 (3.54)[d]	12.23±0.56 (3.50)[c]	10.73±0.10 (3.27)[e]	8.00±0.71 (2.83)[b]	7.75±0.90 (2.78)[b]	5.25±0.79 (2.29)[c]
6.	Lentil	12.43±0.46 (3.52)[d]	12.18±0.69 (3.49)[c]	11.28±0.10 (3.36)[de]	7.00±0.27 (2.65)[c]	6.90±0.37 (2.63)[c]	5.90±0.37 (2.43)[bc]
7.	Sorghum	15.23±0.17 (3.90)[a]	13.40±0.37 (3.65)[a]	12.80±0.54 (3.58)[a]	9.83±0.19 (3.13)[a]	8.80±0.29 (2.97)[a]	7.30±0.74 (2.70)[a]

*Mean of four replications. Figures in parentheses are square root transformed values. Mean followed by same letter (s) in a column are not significantly different by DMRT (P=0.05). Room temperature ranges from 30.5 to 35.25, RH ranges from 77 to 84%

Table 4: Effect of temperature and relative humidity on adult emergence period (egg to adult) and reproductive potential of *S. oryzae* feeding on sorghum and split pulses (February to March)

S. No	Treatments	Deveopemental period (Days)*			Reproductive potential (15 pairs/200 grains)#		
		Room Temperature	35 ºC, 70% RH	35 ºC, 80% RH	Room Temperature	35 ºC, 70% RH	35 ºC, 80% RH
1.	Redgram	29.00±0.82 (5.39)[ab]	30.50±0.58 (5.52)[a]	30.00±0.82 (5.48)[a]	48.50±1.89 (6.96)[b]	42.50±1.29 (6.52)[b]	37.75±1.63 (6.14)[b]
2.	Chick pea	28.25±0.50 (5.32)[b]	30.00±0.82 (5.48)[a]	29.75±0.96 (5.45)[a]	37.75±1.71 (6.14)[d]	31.25±0.96 (5.59)[c]	25.75±1.75 (5.07)[d]
3.	Black gram	28.50±0.52 (5.34)[b]	30.25±0.46 (5.50)[a]	30.25±0.26 (5.50)[a]	28.75±1.50 (5.36)[e]	22.75±1.26 (4.77)[d]	19.63±1.70 (4.43)[e]
4.	Green gram	28.75±0.26 (5.27)[b]	30.50±0.58 (5.52)[a]	29.90±0.84 (5.47)[a]	44.00±1.55 (6.63)[c]	39.75±1.71 (6.30)[b]	32.83±1.09 (5.73)[c]
5.	Fried gram	29.50±0.58 (5.43)[a]	30.75±0.96 (5.55)[a]	30.13±0.73 (5.49)[a]	25.75±1.30 (5.07)[e]	22.25±1.70 (4.72)[d]	15.25±0.96 (3.91)[f]
6.	Lentil	29.75±0.66 (5.36)[a]	31.00±0.82 (5.57)[a]	30.38±0.54 (5.51)[a]	36.75±1.22 (6.06)[d]	30.50±1.29 (5.52)[c]	25.13±1.39 (5.01)[d]
7.	Sorghum	28.00±0.50 (5.36)[b]	29.50±0.50 (5.36)[b]	27.88±0.25 (5.28)[b]	66.00±1.83 (8.12)[a]	61.75±1.36 (7.86)[a]	49.75±1.06 (7.05)[a]

*Mean of four replications. Figures in parentheses are square root transformed values. Mean followed by same letter (s) in a column are not significantly different by DMRT (P=0.05). Room temperature ranges from 30.5 to 35.25, RH ranges from 77 to 84%.
*Fifteen females laying eggs on 200 grains for one day

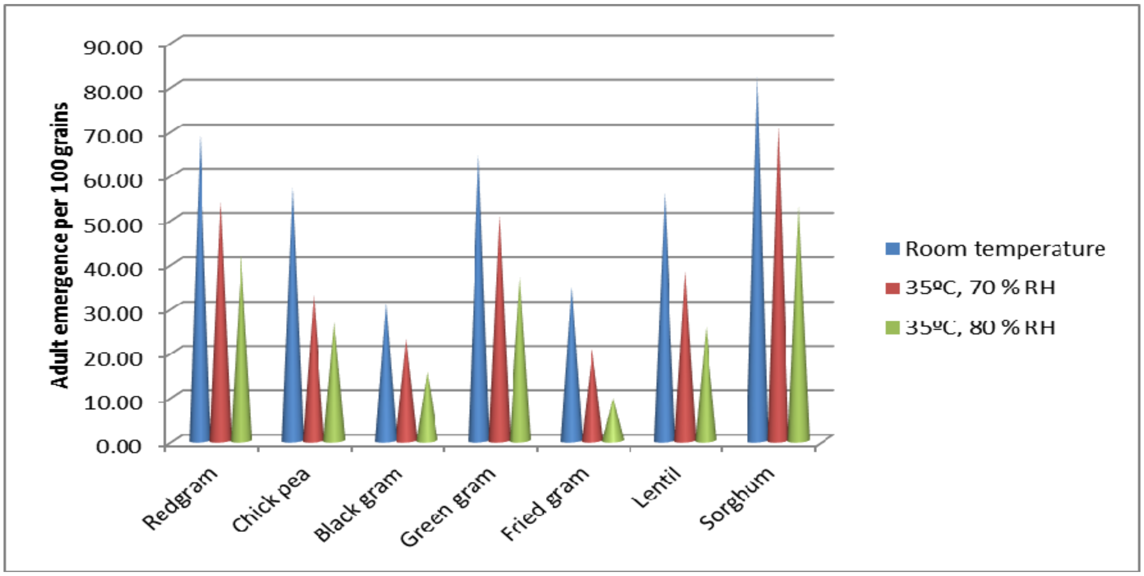

Fig 1: Adult emergence per 100 grains of *S. oryzae* feeding on sorghum and split pulses

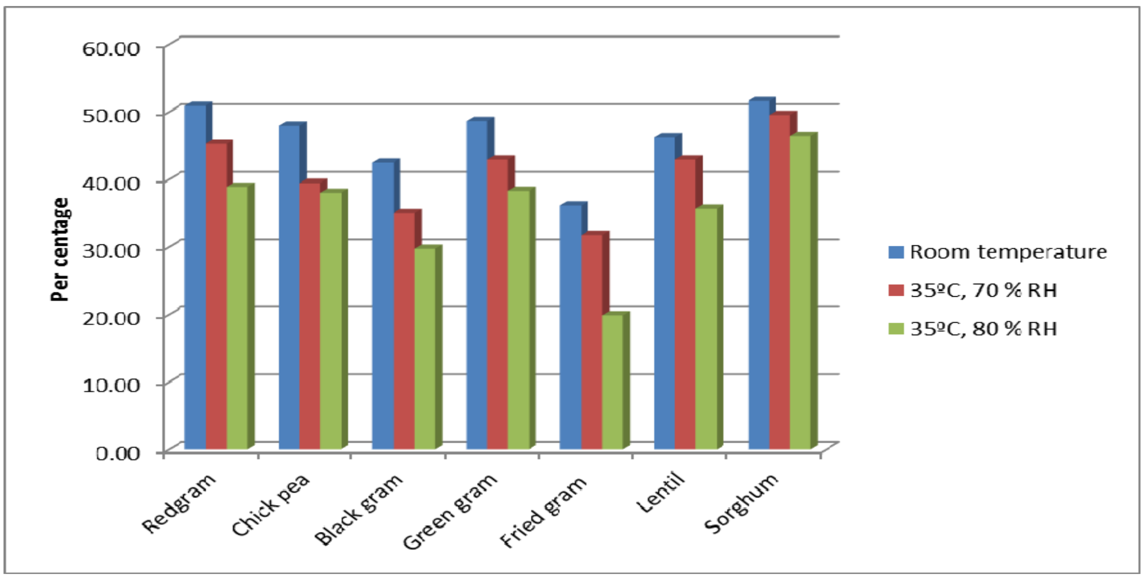

Fig 2: Egg to adult survival percentage of *S. oryzae* feeding on sorghum and split pulses

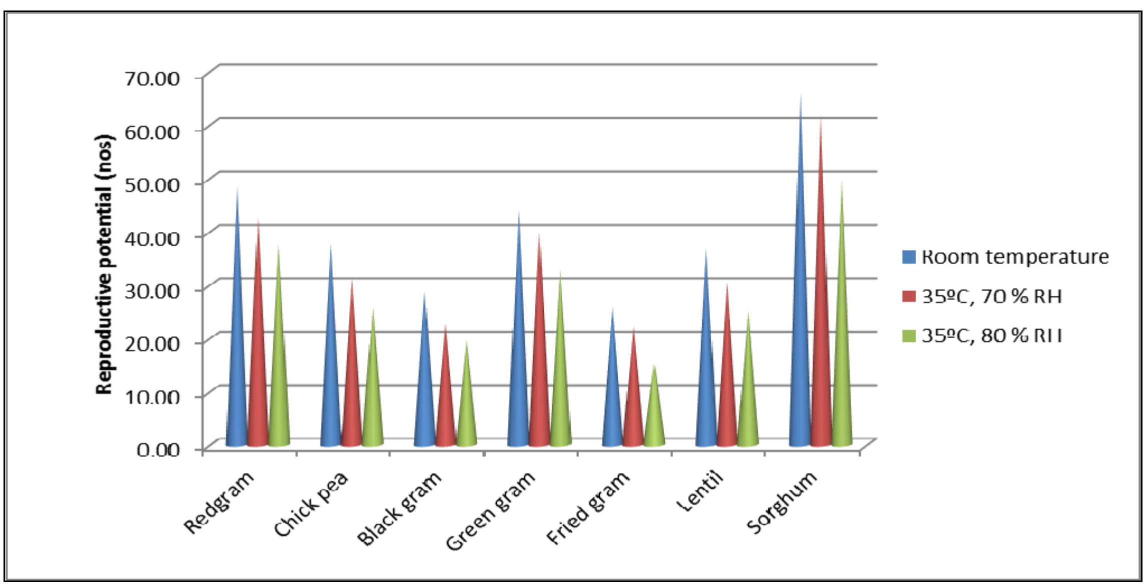

Fig 3: Reproductive potential of *S. oryzae* feeding on sorghum and split pulses

4. Conclusion
Based on the results observed on oviposition rate, total number of eggs per 100 grains, adult emergence per 100 grains, egg to adult survival percentage, adult female and longevity and reproductive potential of *S. oryzae* was higher in redgram followed by greengram, chick pea, black gram and fried gram irrespective of room and controlled temperature conditions tested against *S. oryzae* strain collected from red gram dhal. Developmental period was maximum in lentil and it was on par with green gram feeding by the respective population. It is concluded that fluctuating room temperature was favourable for insect multiplication compared to controlled conditions.

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