



Entomological survey of pests of rice nursery and crop in district Sialkot Punjab-Pakistan

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Abstract

Six year entomological survey was conducted to evaluate the percentage level of pest infestation on fine, coarse and hybrid varieties of rice nursery and crop during Kharif 2010-2015 in agro-ecological zone of District Sialkot Punjab-Pakistan. During entomological survey it was recorded that rice nursery mostly affected by Toka (Grasshopper); Yellow Stem Borer (YSB); White Stem Borer (WSB). Maximum infestation was recorded by Toka (17.67%); Leaf Folder (0%); Borer (4.15%) with temperature ranges 22.97-35.80oC, Relative Humidity (RH) (49.70%) and rainfall 333.80mm. However 0% infestation was recorded by hopper and hispa during 2011. However 15.99% attack was recorded by toka and borer (4.21%) with temperature ranges 22.50-36.12oC; RH (59.50%) and rain fall (118.30mm). After that 0% pest attack was recorded by leaf folder; hopper and hispa during 2013. During 2015, 14.32% pest infestation was recorded by grasshopper and borer (3.02%) with temperature ranges 23.91-35.27oC with RH (60.27%) and 163.20mm rain fall. Maximum infestation of toka was recorded 13.19% with borer 3.30% with temperature ranges 22.66-35.96oC and RH 46.80% with 20.90mm rain fall. However 0% attack was recorded by leaf folders; hoppers and hispa during kharif-2012. Maximum spot-wise pest infestation on crop was recorded by leaf folder (10.07%) followed by toka (8.89%); hopper (6.08%); borer (3.27%). However 0% infestation was recorded by hispa with temperature ranges 22.44-31.59oC with RH (83.16%); 622.90mm rain fall during kharif 2013. Maximum infestation was recorded by toka (10.98%) followed by leaf folder (3.07%); borers (3.07%); hopper (0.67%) and hispa (0%) with temperature ranges 23.52-32.39oC and RH (83.38%) at 554.80mm rain fall during 2014. During recent year 2015 maximum infestation was recorded by toka (11.24%) followed by leaf folder (6.65%); Borer (2.53%); hopper (0.94%) and rice hispa (0.24%) 1st time appeared in Pakistan with temperature ranges 23.55-33.57oC with RH (82.56%) and rainfall recorded 229.30mm.

Keywords: Borers, Grass hopper, hopper, leaf folder, Rice hispa, Sialkot, Punjab-Pakistan.

Introduction

Rice is the second largest food crop after wheat and exportable item in Pakistan. It accounts for 3.2% in the value added in Agriculture and 0.7% of GDP

(Anonymous, 2014). Rice is grown on an area of 2891 thousands hectares with production 7005 thousands tones. Rice is staple food for more than two billion people in Asia and few hundred million in Africa and Latin America (IRRI, 1985; Pillalayar, 1988). Rice

yield is affected by many factors in which, climatic conditions and pest epidemics are most important. Insect-Pests damaged rice crop from nursery sowing to transplanting upto maturity of crop. However the infestation of rice plant hoppers; stem borers; leaf folders are always a serious challenge to rice production. In rice zone the crop yield is seriously affected by pests ranging from 25-30% annually (Hashmi, 1994). The loss caused by insect-pest was estimated at 18% of the expected rice crop yield (Alam, 1983). Natural enemies can be used to kill pests not only by direct attack but also by dislodging them trapping in the web (Landis et. al., 2000).

Descriptions

Rice grasshopper/toka (*Hieroglyphus banian* Fb.)

It is a polyphagous insect and damage is caused by adult and nymphs during July- September when feed on rice crop causing defoliation. The leaves are completely eaten, leaving only midrib and stalk of the crop. At milking stage, the adults attack on the ears and toka has been shown that involved in the

mechanical transmission of *Xanthomonas oryzae* pv. *oryzae*.

Plant hoppers (*Nilaparvata lugens*, *Sogatella furcifera*)

Plant hoppers are important pests of rice and caused 7-10% yield loss but in severe infestation the pest destroyed the crop completely causing hopper burns (Matsumura, 1996). Adults are pale green or brown winged insect with piercing-sucking type of mouthparts. Leaves drying and turn brownish after insect feeding and patches of burned plants are often lodged (Matsumura, 1991). These are also a vector of grassy stunt and ragged stunt virus diseases in rice crop. Feeding punctures on the plants are susceptible to bacterial or fungal infections. Population densities of white backed plant hopper are higher on high yielding varieties than local basmati varieties (Ashraf, 1986). The insect pests not only cause direct damage to crop but also transmit diseases such as viral diseases i.e. tungro virus transmitted by Green leaf hoppers (Iqbal et. al., 2015).



The rice crop damaged by plant hopper showing hopper burn

Stem borer (*Scirpophaga incertulas*, *Scirpophaga innotata*)

Stem borer is monophagous insect, considered the serious pests of basmati rice and infest plants from seedling to maturity (Salim and Masih, 1987). The

caterpillars bore into the stem and hollow out the stem completely. Attacked young plant shows dead heart and an older plant shows white heads. The rice borers activity increased steadily during first 3-4 months of flooding caused 23% damaged to stems at flowering stage (Sigsgaard, 2000).



The rice crop damaged by borer showing dead heart

Leaf folder (*Cnaphalocrocis medinalis*)

The newly hatched larvae are shiny translucent body with a light brown head. Larvae attack the leaves that

feed on the mesophyll of rice plant. They fasten the edges of leaf together by silken fiber released from their mouth that make a chamber and feed from inside.

The moths are nocturnal and its feeding reduces productive leaf area that affects plant growth. Cloudy and humid weather, shady locations and high use of nitrogen fertilizer favor its development. Huge feeding reduces the vigor and photosynthetic ability of rice

plant (Farooq et. al., 2014). If larvae feed on flag leaf then it causes maximum damage in rice yield, moreover the infested plants are predisposed to bacterial and fungal infection (Bashir et. al., 2004a).



The rice crop damaged by leaf folder showing scraping of leaf sheath

Rice hispa (*Dicladispa armigera*)

Rice hispa is one of the major pests of rice (Palaszek et. al., 2002; Hazarika et. al., 2005). The yellowish grub make mines into the leaves presenting blister spots. It causes considerable loss to vegetative stages of rice resulting in yield loss upto 28% (Nath and Dutta, 1997). White streaks are parallel to the midrib are appeared at damaged leaf. Tunnels are developed between two epidermal layers as the result the photosynthetic area of plant is reduced and stunted

resulting in yield losses up to 68% (Iqbal et. al., 2015). Adults and nymph scratch the parenchymatous tissues from upper surface of leaf. Grubs residing in leaf in the form of mines that are clearly seen and identified. Grub eats away chlorophyll or green matter resulted in withering and drying up of leaves (Iqbal et. al., 2015). However the comprehensive study was planned to evaluate the major threats of insect pests on rice crop in agro-ecological zone of District Sialkot Punjab-Pakistan on nursery and rice crop during kharif 2010-2015.



The rice crop damaged by hispa

Materials and Methods

Entomological survey was conducted to evaluate the percentage level of pest infestation on fine, coarse and hybrid varieties of rice nursery and crop during Kharif 2010-2015 in agro-ecological zone of District Sialkot Punjab-Pakistan. In order to perform entomological survey about insect-pest of rice nursery and crop four Tehsils viz, Sialkot, Sambrial, Daska and Pasrur were selected from District Sialkot, Punjab-Pakistan according to Kharif action plan. All observations regarding Pest succession, spot-wise infestation (%) of borer, toka, hopper, leaf folder and hispa were planned on well developed pre planned questionnaire. Collection of data was recorded on weekly basis from rice fields. Meteorological data viz, Temperature °C

(Maximum, Minimum), Relative humidity (%) and Rainfall (mm) was recorded regularly on weekly basis from Pakistan Meteorological Department Sialkot. Identification and nature of damage to crop at different stages were performed and calculated at the spot in the field. Diagonal method of pest scouting was adopted to calculate Economic Threshold Levels (ETL) of different insect-pest attack. The ETL of Toka (Grasshopper) and Borer are 3-5/net or swipe and 0.5% on nursery and 5% on rice crop and leaf folder 2-3 rolled leaf per plant respectively. The economic threshold level of brown plant hopper (BPH) is 15-20 per plant in July-August and 20-25 per plant in September-October. The spot-wise infestation of pest was calculated by the formula (Farooq et. al., 2014).

Results and Discussion

Table-1 and 2 showed that infestation (%) in rice nursery was recorded by toka (6.92%); Leaf Folder (0%); Borer (1.50%); Hopper (0%) and rice hispa (0%) with temperature ranges 23.86-38.16oC; RH (41.31%) with rain fall (64.70mm) during 2010. However 17.67% infestation recorded by Toka; Leaf Folder (0%); Borer (4.15%) with temperature ranges 22.97-35.80oC with RH (49.70%) and rainfall 333.80mm. However 0% infestation was recorded by

hopper and hispa during 2011. Maximum infestation of toka was recorded 13.19% with borer 3.30% with temperature ranges 22.66-35.96oC and RH 46.80% with 20.90mm rain fall. However 0% attack was recorded by leaf folders; hoppers and hispa during kharif-2012. However 15.99% attack was recorded by toka followed borer (4.21%) with temperature ranges (22.50-36.12oC) with RH (59.50%) and rain fall (118.30mm). However 0% pest attack was recorded by leaf folder; hopper and hispa during 2013.

Table 1: Year-wise comparison of pest infestation (%) on rice nursery during kharif 2010-2015

Year	Toka	Leaf Folder	Borer	Hopper	Hispa
2010	6.92	0	1.50	0	0
2011	17.67	0	4.15	0	0
2012	13.19	0	3.30	0	0
2013	15.99	0	4.21	0	0
2014	12.46	0	4.04	0	0
2015	14.32	0	3.02	0	0

During 2014, spot-wise attack was recorded by toka (12.46%) followed by borer (4.04%) with temperature ranges 21.63-34.96oC with RH (52.60%) and annual rain fall (196.50mm). However 0% attack was recorded by leaf folder; hopper and hispa at this

temperature. During 2015, 14.32% pest infestation was recorded by grasshopper and borer (3.02%) with temperature ranges 23.91-35.27oC with RH (60.27%) and 163.20mm rain fall.

Table 2: Year-wise meteorological data of rice nursery

Year	Temperature		Relative Humidity %	Rainfall (mm)
	Maximum oC	Minimum oC		
2010	38.16	23.86	41.31	64.70
2011	35.80	22.97	49.70	333.8
2012	35.96	22.66	46.80	20.90
2013	36.12	22.50	59.50	118.3
2014	34.96	21.63	52.60	196.5
2015	35.27	23.91	60.27	163.2

Rice crop

From the table 3 and 4 pest infestation was recorded by toka (3.67%); leaf folder (6.73%); borer (1.53%); hopper (2.13%) and rice hispa (0%) with temperature ranges 24.39-31.86oC and RH (74%) and rain fall (629mm) during 2010. However in case of Toka (7.49%) infestation was recorded followed by borer (3.63%); hopper (2.52%); leaf folder (2.11%); hispa (0%) with temperature ranges 23.81-32.53oC and RH (73.47%) and 260mm rain fall during kharif-2011.

During 2012 maximum attack was recorded by leaf folder (18.04%) followed by toka (6.41%); borer (2.87%); hopper (1.01%) and in hispa (0%) with temperature ranges 22.80-32.90oC with RH (77%) and rain fall (398.90mm).

Table 3: Year-wise comparison of pest infestation (%) on rice crop during kharif 2010-2015

Year	Toka	Leaf Folder	Borer	Hopper	Hispa
2010	3.67	6.73	1.53	2.13	0
2011	7.49	2.11	3.63	2.52	0
2012	6.41	18.04	2.87	1.01	0
2013	8.89	10.07	3.27	6.08	0
2014	10.98	3.07	3.07	0.67	0
2015	11.24	6.65	2.53	0.94	0.24

However maximum spot-wise pest infestation was recorded by leaf folder (10.07%) followed by toka (8.89%); hopper (6.08%) and borer (3.27%). However 0% infestation was recorded by hispa with temperature ranges 22.44-31.59oC with RH (83.16%) with 622.90mm rain fall during kharif 2013. Maximum

spot-wise infestation was recorded by toka (10.98%) followed by leaf folder (3.07%); borer (3.07%); hopper (0.67%) and hispa (0%) with temperature ranges 23.52-32.39oC and RH (83.38%) at 554.80mm rain fall during 2014.

Table 4: Year-wise meteorological data of rice crop

Year	Temperature		Relative Humidity %	Rainfall (mm)
	Maximum oC	Minimum oC		
2010	31.86	24.39	74.00	629.00
2011	32.53	23.81	73.47	260.00
2012	32.90	22.80	77.00	398.90
2013	31.59	22.44	83.16	622.90
2014	32.39	23.52	83.38	554.80
2015	33.57	23.55	82.56	229.30

During recent year 2015 maximum infestation was recorded by toka (11.24%); leaf folder (6.65%); Borer (2.53%); hopper (0.94%) and hispa (0.24%) with temperature ranges 23.55-33.57oC with RH (82.56%) and rainfall recorded 229.30mm. These results are in accordance to Karuppaiach et. al., 2012 who reported that survival of leaf folder was gradually affected at 35oC. The incidence of Rice hispa (*Diadisa armigera*) was recoded a serious pest of rice crop in low-lying areas during the year 1984-1987. This pest again reported after a gap of 28 years from Tehsil Daska District Sialkot, Punjab-Pakistan and its damage was recorded upto 68% (Iqbal et. al., 2015).

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