Table 1: Growth parameters of hawkmoth on blackgram

Stage	Length (mm)		Head capsule width (mm)	
	Range	Average	Range	Average
Egg	0.92-1.02	0.96±0.032	-	-
Larvae				
I	4-6	5.64±1.05	0.68-0.74	0.71±0.02
II	11-15	13.30±1.76	1.02-1.25	1.14±0.81
III	24-29	25.8±1.80	1.65-1.96	1.79±0.11
IV	37-49	42.68±4.21	2.78-3.30	3. 02±0.19
V	55-64	59.26±3.51	4.60-5.04	4.89±0.15
Pre-pupa	52-57	54.26±2.50	-	-
Pupa	51-54	52.32±1.21	-	-

Table 2: Developmental periods of hawkmoth on black gram

Sl.No.	Stages	Duration (days)	
		Range	Av.± S.D.
1	Egg period	5-10	7.65±1.78
2	Larval period		
	I	4.0-5.0	4.80±0.42
	II	2.0-5.0	3.70±1.16
	III	4.0-6.0	5.20±0.78
	IV	5.0-7.0	5.70±0.67
	V	6.0-8.0	7.05±0.83
3	Total larval period	21-31	26.45±2.43
4	Pre-pupal period	2-4	2.95±0.68
5	Pupal period	12-17	14.8±1.11
6	Adult longevity		
7	Male	10-12	10.7±0.83
8	female	13-15	13.8±0.92
9	Pre-oviposition period	2-3	2.4±0.51
10	Oviposition period	7-9	7.7±0.82
12	Mating period (Minutes)	25-30	
13	Fecundity (No. of eggs/female)	82-129	104.0±16.53
14	Total life cycle	41-59	51.80±5.06

Record of invasive *Quadrastichus erythrinae* Kim, gall wasp on *Erythrina variegata* L. from Eastern India with notes on gall morphologies

Bijan Kumar Das and Barindra Talukdar[1]
All India Coordinated Research Project on Medicinal & Aromatic Plants and Betelvine, Directorate of Research, Bidhan Chandra Krishi Viswavidyalaya, Kalyani-741 235, Nadia, W.B.
[1]*Department of Agricultural Entomology, BCKV, Mohanpur, Nadia, W.B., India*

The erythrina gall wasp (EGW), *Quadrastichus erythrinae* Kim (Hymenoptera: Eulophidae) has proved itself as the most aggressive, invasive and destructive arthropod pest in Indo- Australasian, Afrotropical and Nearctic regions in last ten years, posing threat to native *Erythrina* species (Heu et al., 2008).

In India, this invasive alien pest was recorded on *Erythrina* spp, in Maharashtra, and Karnataka in 2004 (Kore, 2006) and in Kerala in 2005 (Faizal et al., 2006) on a serious proportion rendering the black pepper, betelvine and vanilla cultures at stake, where *Erythrina* trees are used as support trees for these crops. Since its records in southern parts of India, no report is found from other parts of the country.

In the present study, the incidence of gall inducing wasp, *Q. erythrinae* on *E. variegata* L. from West Bengal has been recorded during 2008-2010. In December 2008, severe gall infestation in *E. variegate* L. at Dakshineswar of North 24-Parganas district in West Bengal. In January, 2009, Dakshineswar area was surveyed to record the incidence, and gall samples were collected, adults of gall inducing insect were reared from the mature galls in the laboratory and studied. The gall inducer was a wasp and identified as *Quadristichus erythrinae* Kim by Professor T. C. Narendran (Retd.), Calicut University, Kerala.

A cursory survey (about 200 trees/ plants were observed) indicated that at Kalyani (southern part of Nadia district and about 40 km north of Dakshineswar), mild infestation of EGW was noticed in trees in January 2009; during March 2009, almost 70% of the *Erythrina* trees got mild to moderate infestations and one older tree was severely infested (about 200 trees/plants were observed); in February 2010, 100% trees were infested, but no tree was found dead or devoid of green leaves. However, we could not find any gall infestation on *Erythrina* in Kalyani two years before (i.e., in early 2008). In January 2009, no gall could be detected on *Erythrina* in Krishnagar of Nadia district (50 km north of Kalyani) and at Lalbagh of Murshidabad district (150 km north of Kalyani). However, in February 2010, 80% of *Erythrina* trees were found infested to varied degrees at Krishnagar. The pattern of incidence of EGW in three districts in different years indicated that the insect is progressing northwardly. Preliminary studies on the nature of gall induction and symptoms were studied both at Dakshineswar and Kalyani and are described below.

The wasp larvae have been found to induce galls on the developing shoot, petiole, rachis and leaflet. The larvae develop and pupate within the gall tissue. After pupation within the gall, adult wasps escape through the holes cut by them. The morphologies of galls depend on the degree of infestation. When infestation is mild, the individual gall can be recognized on leaflet, petiole and terminal stem without any major deformities of the modules. These galls are unilocular, solitary but when thickly populated, several galls arise close together and may agglomerate. If the infestation is comparatively high, the leaflets are crinkled with moderate deformity; irregularly knotted structures on the petiole, rachis and stem.

The extensive manifestation of gall growth is seen, if very early developing vegetative parts are attacked by a large number of insects (larvae). Huge number of galls occur closely on small developing leaflets, rachis and shoot; the leaflets become smaller in size, curled, greatly thickened, severely deformed and fleshy; the petiole, rachis and shoots also become enormously swollen and shortened.

In extreme cases, the developing vegetative shoot and the petiole, rachis and leaflets on it are transformed into a mass of some large to small sized, tuber like structures; individual plant modules on the shoot cannot be distinguished.

The deformed stem ends do not produce new leaves. Further; they are very small in size and infest immediately showing a bushy appearance. Eventually heavily infested terminal shoots become bushy and severely malformed. After emergence of adult wasps, such heavily infested shoot ends dry up. In some large older trees, the branches become devoid of leaves and terminal galled shoot ends become dark black in colour showing loss of growth and vigor. Some braches dry up. In the present survey, few trees in Dakshineswar also appeared to die.

The wasps were also found to induce galls on flowers at Kalyani. This is the first record of flower gall induced by EGW. Multiple galls may arise on the rachis of the inflorescence which becomes swollen. Individual flower bud may contain galls on peduncle, thalamus or calyx. If peduncle and thalamus are infested, the respective floral part swells and flower may open but pod may not develop. When galls develop on the calyx of the unopened flower buds, further growth of bud is arrested; the buds become deformed with irregular swellings on the surface of the calyx; the calyx is thickened, corolla and other floral parts can not come out of the calyx which fully covers them in bud stage. In extreme cases, all flower buds on the rachis become globular in shape instead of long and slender as seen in normal condition. More than 50% of the flowers in a rachis were found infested by EGW at Kalyani, Nadia in March, 2009.

References:

Faizal, M. H., Prathapan, K.D., Anith, K. N., Mary, C.A., Lekha, M. and Rini, C. R. 2006. *Curr. Sci.*, **90:** 1061-1062.

Heu, R. A., Tsuda, D. M., Nagamine, W. T., Yalemar, J. A. and Suh, T. H. 2008. *New Pest Advisory*, No. 05-03, Department of Agriculture, State of Hawaii.

Kore, B. 2006. *Curr. Sci.*, **91:** 8.

Fusarium solani [Mart.] as a naturally occurring pathogen of bagworm *Pteroma plaiophelps* in coconut

N. Emmanuel, N.B.V. Chalapathi Rao and A. Snehalatha Rani
Horticultural Research Station, Andhra Pradesh Horticultural University, Ambajipeta - 533214, East Godavari District, Andhra Pradesh, India.

In Godavari districts of Andhra Pradesh, the defoliator pest *viz* bag worm *Pteroma plagiophelps* Hamps (Lepidoptera: Psychidae) was found feeding voraciously on the coconut and its intercrops viz., cocoa, arecanut and banana [Emmanuel *et al.*, 2010 a,b]. The caterpillar lives inside the case and feed on the leaves from the central leaf lamina leaving a circular to irregular holes.

In a roving survey conducted in the Godavari district of Andhra Pradesh (south India) the bagworm *P. plagiophelps* cadavers were collected in the coconut gardens and found to be infected with fungal mass. The fungal mycelium from the infected insects were plated on PDA medium. Light brown colored fungal growth was observed after one week of incubation at 26 ± 2°C and under 16-h photoperiod. Conidia were obtained from 4-week-old cultures by adding 10 ml of sterile 0.1% Tween 80 into the petri dishes. The viability of conidia of each isolate were determined by inoculating them onto water agar (1%) and assessing the germination after 24 h of incubation at 24 ± 2°C and under 16-h photoperiod. The pure culture of the fungus was multiplied on the PDA medium and sent to ITCC, IARI, New Delhi for identification. The associated fungus was found to be *Fusarium solani*. The characteristics on the PDA medium were: Microconidia formed in chains on monophialides, oval shaped with no septa and measuring 6-10 x 1.5-2.5 mm. Macroconidia formed in pale orange sporodochia, slightly falcate or else straight with thin walls, and the basal cell foot-shaped, 3-5 septate, 25-55 x 2-4 mm.

The spores of *Fusarium solani* at concentration of 1.0×10^{8} were tested against the third instar larvae of bagworm *Pteroma plagiophelps* . The coconut leaf strips were dipped into 25 ml of conidial suspension of above said concentration and then placed inside the glass tube size of 6 x 2 inches. Ten Pre-starved third instar bagworm larvae were transferred to the glass tube containing the coconut leaves treated with fungal spore suspension. The treatment was replicated ten times and mortality data was recorded at every 24 hours. Studies on the mortality data reveals that 100 per cent mortality of the larval population was achieved in 3 days and maximum mortality [50 %] was observed at 1day after treatment [DAT] and 33.33 per cent at 2 DAT and 16.67 per cent on 3 DAT. However, further