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STUDIES ON INFESTATION OF BROWN SOFT SCALE *COCCUS HESPERIDIUM* LINNAEUS ON DIFFERENT SPECIES OF *CYMBIDIUM* ORCHID UNDER AGROCLIMATIC CONDITIONS OF UTTARAKHAND

R.M. SRIVASTAVA, A.K. TIWARI AND L.B. YADAV

V.C.S.G. College of Horticulture, Bharsar, G.P. Pant University of Agriculture and Technology Bharsar, Pauri Garhwal, Uttarakhand – 246 123

ABSTRACT

Brown soft scale *Coccus hesperidium* was recorded infesting various species of *Cymbidium* orchid. Four year data, 2006-09 showed that population on Brown soft scale was positively correlated with temperature and moisture. Maximum infestation was observed in the month of May whereas minimum was in December. *Cymbidium hookerionum, C. longifolium* and *C. mastonon* species harbored negligible scale insect population and performed well in the agroclimatic condition of Uttarakhand, whereas *C. eburneum* species showed poor performance due to severe scale infestation.

Key words: Brown soft scale, *Coccus hesperidium*, *Cymbidium* orchid.

The brown soft scale, *Coccus hesperidum* Linnaeus is one of the more common insect pests of interiorscapes and conservatories (Stauffer and Rose, 1997) with a host range that include many tropical and subtropical plants including ficus, hibiscus, oleander, palms, ferns and orchids (Malais and Ravensberg, 2003). Miller and Davidson (2005) list brown soft scale as one of the 43 most serious scale pests. This scale occurs throughout the tropics and as a greenhouse pest in most temperate climates (Dekle 1965 and Miller 2005). The present study includes screening of cymbidium group varieties for population dynamics of the scale insect.

MATERIALS AND METHODS

The experiment was carried out in the polyhouse at the Floriculture section of V.C.S.G. College of Horticulture, G.P. Pant University, Bharsar Pauri Garhwal during 2006-2009. The College of Horticulture Bharsar is located at a latitude of 30 03 N and longitude of 78 59 E and altitude of 2000 m above mean sea level. Planting materials were collected from Private Nurseries of Gangtok, Sikkim, Darjeeling and Kalimpong hills of West Bengal and IHBT Palampur (HP). Three year of old flowering size plants of 8 species were planted in 25 cm size pots and again the plants were re-potted in 30 cm size pot after two years. The potting medium was prepared with saw dust, leaf mould, FYM, broken bricks and charcoal (1:1:1:1). Population of scale insects were observed at weekly intervals from 5 leaves of 25 plants for each variety. Weekly population data was pooled in monthly data and thus population dynamics of scale insect was observed throughout the year. Four year data from 2006-2009 were collected. All the data were pooled and subjected to statistical analysis as suggested by Gomez and Gomez (1983).

RESULTS AND DISCUSSION

Four year data from 2006-2009 indicated that there is considerable variation in the population of Boisduval scale *Diaspis boisduvalii* throughout the year. No scale insect population was observed in *Cymbidium hookeranum* and *C. lingifolium* throughout the year, whereas *C. mastonon* harboured negligible population. Maximum infestation of scale insect was observed in *C. ebarangum*(72.14/month) followed by *C. gegantinum* (31.41) and *C. inadeucles* (27.82). Hybrid variety of cymbidium had medium infestation (12.12), whereas *C. elegans* and *C. masstonin* have number of scale insects were recorded on orchids, whereas in December minimum population was observed in all the species of cymbidium orchids. It was observed that insect population increased gradually from December, attained peak population in May and declined slowly after monsoon period. From the data presented in Table 1 it is evident that incidence and population buildup of Brown soft scale on orchids was remarkably influenced by the temperature and the host plant species during 2006-2009. In January Elegans, Hookeranum, Mastonin and Longifolium varieties had no infestation of scale insect,

Table 1. Screening of different cultivars of cymbidium orchids against red scale

S. No.	Orchid variety	January					February					March					April				
		2006	2007	2008	2009	Mean	2006	2007	2008	2009	Mean	2006	2007	2008	2009	Mean	2006	2007	2008	2009	Mean
1.	Gegantinum	8.54	9.78	5.65	2.67	6.66	23.63	34.78	45.87	21.67	31.48	34.56	32.67	56.87	24.87	37.24	56.98	54.98	78.53	43.83	58.58
2.	Elegans	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.	Hookeranum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.	Masstonin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.	Longifolium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.	Ebarangum	14.67	25.64	22.89	17.63	20.20	34.67	45.75	56.84	32.86	42.53	69.00	75.87	65.47	73.85	71.04	167.98	156.3	123.67	90.56	134.66
7.	Inadeucles	5.34	17.56	8.98	20.64	13.13	23.78	12.78	23.51	17.83	19.47	29.93	34.28	29.14	30.85	31.05	56.34	46.87	58.43	41.85	40.69
	Hybrid	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.87	7.56	5.82	7.95	6.30	20.86	15.83	45.67	12.43	23.69
	CV					1.559					1.478					1.436					1.462

S. No.	Orchid variety	May					June					July					August				
		2006	2007	2008	2009	Mean	2006	2007	2008	2009	Mean	2006	2007	2008	2009	Mean	2006	2007	2008	2009	Mean
1.	Gegantinum	65.76	60.87	80.83	53.91	65.34	53.67	45.32	67.32	34.84	50.28	25.34	23.56	37.45	21.45	26.95	21.36	18.65	27.36	14.23	20.40
2.	Elegans	10.45	0.00	9.53	0.00	4.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.	Hookeranum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.	Masstonin	7.43	0.00	8.32	0.00	3.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.	Longifolium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.	Ebarangum	245.32	178.453	178.21	121.23	180.80	167.34	124.25	128.93	87.63	127.03	124.25	90.34	98.37	78.92	97.97	42.67	76.36	65.36	57.38	60.44
7.	Inadeucles	67.21	52.98	68.92	50.31	59.85	39.00	48.12	42.84	38.29	42.06	27.39	32.40	29.42	28.31	29.38	15.26	25.36	20.38	16.39	19.34
	Hybrid	36.32	27.32	67.21	25.21	39.01	20.32	18.39	39.37	13.28	22.84	12.43	13.26	32.43	10.32	17.11	7.30	6.39	12.30	2.30	7.07
	CV					1.389					1.457					1.380					1.558

Table 1. Continued.,...

S. No.	Orchid variety	September					October					November					December					Overall Mean
		2006	2007	2008	2009	Mean	2006	2007	2008	2009	Mean	2006	2007	2008	2009	Mean	2006	2007	2008	2009	Mean	
1.	Gegantinum	38.30	45.38	47.39	27.37	39.61	27.49	23.48	32.48	19.20	25.66	12.29	16.28	15.20	7.28	12.76	0.00	0.00	0.00	8.29	2.07	31.41
2.	Elegans	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42
3.	Hookeranum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.	Masstonin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32
5.	Longifolium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.	Ebarangum	57.48	89.39	79.49	67.39	73.43	21.29	49.37	49.38	23.39	35.85	9.29	29.39	12.20	10.23	15.27	2.34	0.00	3.40	20.30	6.51	72.14
7.	Inadeucles	26.38	38.49	36.49	32.26	33.40	13.40	28.38	23.32	21.29	21.59	9.30	17.20	16.20	12.30	13.75	8.10	12.20	11.30	9.39	10.24	27.82
8.	Hybrid	18.39	14.28	17.39	7.40	14.36	10.29	5.87	16.28	3.29	8.93	8.20	3.29	9.20	0.00	5.17	4.29	0.00	0.00	0.00	1.07	12.12
		CV				1.241					1.181					1.232					1.481	

Mean	Months											
	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Max Temp. (2006-09)	7.66	14.30	22.00	24.60	26.66	23.09	21.56	18.77	18.30	16.50	15.60	10.80
Min. Temp. (2006-09)	1.60	4.08	9.40	13.43	13.48	13.51	12.16	10.51	10.54	8.62	3.16	0.86
Humidity (2006-09)	35	38	40	41	44	50	70	85	80	75	50	34

whereas Ebarangum had initial population of 20.20 per plant followed by 13.13 in Landeucles and 6.66 in Gegantinum, which increased up to 134.66, 58.58 and 40.69 per plant in the month of April, respectively, however no infestation was recorded in other species up to April except hybrid species. Mean temperature in January was 9.40C which was increased gradually up to 20.50C in April. Maximum number of scale insects were observed in the month of May, it was 180.80 in *Ebarangum*, 65.34 in *Gegantium* and 59.85 in *Inadeucles*. However, *Hookeranum* and *Longifolium* species had no pest infestation. Mean maximum temperature of May month was 26.66 °C and minimum was 13.48 °C. Humidity level was 50 per cent in this month. Population of brown soft scale declined after May and it reached from 180.80 to 60.44 in August in *Ebarangum* species. Moisture content was up to 85 per cent during rainy season. It is clear from Table 1 that optimum temperature of 26.00C and moisture of 60-70 per cent was favorable for growth and development of the scale insect. The life cycle of brown soft scale *Coccus hesperidium*, from egg to adult, takes between 40 to 60 days, however this is dependent on temperature. Gill, 1988, Kosztarab 1996, Johnson, 2002 also reported that temperature plays an important role in life cycle of brown soft scale *Coccus hesperidium*. Earlier, positive correlation with maximum temperature, R.H with population of brown soft scale but inverse relation was observed with minimum temperature. In present population brown soft scale was positively correlated with temperature and moisture thus findings of present study is in accordance with above workers.

Survival rate of cymbidium orchid was also affected by scale population. It is clear from the Table-2 that mean survival rate of *Elegans, Hookarionum, Mastersii* and *Hookerionum* species was up to 95 per cent and scale insect population on these plants was 0.42,0.00.0.32 and 0.00 per plant respectively. Minimum survival rate was observed in *Eburneum* species (9.25 per cent) with highest scale insect population of 72.14 per plant. Direct damage caused by soft scales is due to the actual feeding of scale on the host plant. Indirect damage can occur due to the growth of sooty mold associated with honeydew production. In present study scale population was negatively correlated with per cent survival rate of cymbidium orchid. *Coccus hesperidum* scale feeds from the phloem of the host plant and are found on stems, leaves and green twigs where they are associated with veins causing damage to the plant, thus population of this scale affected the plant survival. Damage due to the feeding of an individual scale is small, however, when large populations are present yellowing, defoliation, reduction in fruit set and loss in plant vigor are caused (Gill, 1988). Survival of cymbidium orchid is also affected by brown soft scale as it produces large quantities of honeydew, a clear sticky liquid that serves as a growing medium for black sooty mould fungi, which may negatively impact plant appearance and reduce photosynthesis (Gill, 1988, Malais and Ravensberg, 2003).

It can be concluded, that population of brown soft scale *Coccus hesperidium* is positively correlated with temperature and moisture. Maximum infestation was observed in the month of May, whereas minimum was in December. *Cymbidium hookerionum, C. longifolium* and *C. mastonon* species harbored negligible scale insect population and performed well in the agroclimatic condition of Uttarakhand. *C. eburneum* species have poor performance due to severe scale infestation. Present study will be helpful to generate basic information regarding population dynamics, effect of temperature and other parameters on brown soft scale infesting cymbidium orchid and its impact on survival of host.

Table 2. Survival (Per cent) of various species of Cymbidium

Varieties	First year	Second year	Third year	Fourth year	Mean
	2006	2007	2008	2009	
C. gagantium	62.50	50.00	50.00	50.00	53.00
C. elegans	95.00	95.00	95.00	95.00	95.00
C. hookerianum	95.00	95.00	95.00	95.00	95.00
C. mastersii	95.00	95.00	95.00	95.00	95.00
C. longifolium	95.00	95.00	95.00	95.00	95.00
C. eburneum	25.00	5.00	5.00	2.00	9.25
C. iriodiodes	75.00	70.00	70.00	60.00	68.50
Hybrid	77.50	75.00	60.00	60.00	68.12

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