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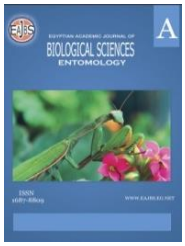

Correlation Between the Incidence of Datepalm White Scale Insect, *Parlatoria blanchardii* and Abiotic Factors

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ABSTRACT

The seasonal incidence of *P. blanchardii* on datepalm was mild during May and June and then on the onset of monsoon its population increased and reached to maximum during December and January months. The highest population of this pest was recorded during the month of January while, minimum in the month of June. The scale population showed a significant negative correlation with maximum and minimum temperatures. While non-significant negative correlation with maximum relative humidity and rainfall. However, minimum relative humidity had a significant negative correlation.

INTRODUCTION

Date Palm (*Phoenix dactylifera* L.), a monocotyledonous and dioecious plant belongs to family Arecaceae (Palmaceae), is considered as one of the world's most former cultivated fruit trees. Antiquarianism evidences suggest that the datepalm was domesticated some 6000 years ago in the Mesopotamian Region (Zohary and Hopf, 2000). It is extensively cultivated in barren and arid zones of the Middle East and North Africa. The major datepalm producing nations in the world are Iraq, Saudi Arabian, Iran, United Arab Emirates, Egypt, Pakistan, Morocco, and Algeria. Besides these countries, Libya, Tunisia, Sudan, Oman, the Aden, the United States of America, and Bahrain also produce dates in considerable quantities. In India, total field area under growing expanding to 16,000 ha in 2010-2011 from 8,973 ha in 2000-2001, escorted by the production of 120,000 mt with the highest area of date palm growing in *Kachchh* territory of Gujarat (Shandilaya, 2012). The area under date palm cultivation is now 19400 hectares with a production of 16635 mt (Anonymous, 2018). The datepalm cultivation was firstly introduced in Rajasthan, by the ruler Ganga Singh ji of the former Bikaner state. In Rajasthan, it's farming has great prospective in Jaisalmer, Barmer, Hanumangarh, Bikaner, Jodhpur, Sri Ganganagar, Nagour, Pali, Jalor and some portion of Churu district with provided irrigation facility and therefore, date palm orchards have recently been established in these districts in about 850 ha area (Anonyms 2018). Datepalm fruits are eaten as crisp fruits (half-ripe

stage), dry date *(chhuhara)*, and soft date *(pind khajoor)*. Disparate prepared products like toffees, wine, chutney, jam, sugar, starch, vinegar, juice, pickles etc. are also prepared from date fruits. Datepalm fruits are greatly nutritious and consist of high calorify rate (3150 calories per kilogram of crisp fruits), 60-65 percent sugar, a fair amount of fibre 2.5 percent, protein 2.0 percent, less than 2.0 percent fat and up to 2.0 percent minerals i.e. iron, copper, magnesium, chloride, sulphur, potassium, calcium, and phosphorus etc. (Gopalan *et al*., 1985). Leaves of datepalm are used for making temporary huts, brooms, ropes, building material, fuel, baskets, and paper. Date palm seeds are used in making of cattle and poultry feed. Datepalm seeds oil is also suggested for use in nourishing and edible purposes (Abdul Afiq *et al*., 2013). White datepalm scale *P. blanchardii* (Targ.) is the most destructive pests infesting datepalm trees. Adults and nymphs of this insect feed on leaves sap, sucking a great amount of sap which contains macro and microelements. At a huge level of infestation with this scale insect, remarkable damage occupied, resulting in early fresh leaves droop and fruit yield reduction (El-Said, 2000). This insect can cause heavy damage by sucking the plant sap that gives low rates of photosynthesis and respiration which leads to curling, yellowing, drooping to leaves. A characteristic symptom of infestation by *P. blanchardi* is the appearance and accumulation of its scales on attacked palm parts (El-Said, 2000, El-Sherif *et al.*, 2001 and Blumberg, 2008). The infestation of this pest in the early stage of plantation saplings may die. *P. blanchardii* influences photosynthetic pigments like chlorophyll-a and b and carotenoid, it also affects the area of the leaflet, moisture, dry weight, and wax proportion, ultimately reduction of yield production as 30-50 kg per palm (Idris, *et al*., 2006). It may hold out to 85-90 percent losses dependent on, the resistance of varieties, intensification of infestation, and orchard management (Ahmed, 2004). In order to prevent the loss caused by insect pests and produce a qualitative crop, it is a must to manage the population of peat at the appropriate time with convenient measures. To establish an effective management approach against *P. blanchardii*, it is essential to know about its bio-ecology including population dynamics and climatic factors influencing the life cycle and the frequency of different phonological phases. The key abiotic components like temperature, relative humidity, and rainfall play an imperative part in population variation of insect pests. During the last decade, datepalm orchards have been established in the northwestern part of Rajasthan so it is imperative to know the status of the scale insect population. Survey of insect pests in a particular agro-climatic zone provides the information and instruction about the condition of insects which helps in developing adequate pest management planning and approaches.

MATERIALS AND METHODS

The experiment was conducted at Date Palm Research Centre and Department of Entomology, College of Agriculture, Bikaner from October, 2017 to September, 2019. Geographically, the Date Palm Research Centre of Swami Keshwanand Rajasthan Agricultural University (SKRAU) is situated 07 km away from Bikaner on NH-15 at 234.7 m above sea level at latitude 28° 01’ N and longitude 73° 22’ E. Bikaner has an arid climate with an annual average rainfall of about 200 to 300 mm. More than 80 percent of rainfall is received in the southwest monsoon season. During summers, the maximum temperature may go as high as 48°C while in winter it may fall as low as 0°C. This region is prone to high wind velocity and soil erosion.

The population fluctuations of scale insect infesting date palm trees were carried out at Date Palm Research Center, SKRAU, Bikaner during two successive years (2017/18 and 2018/2019). Ten palms of variety Khadrawy were selected as uniform as possible in age (15 years), shape, a height which was practiced at half-monthly intervals. The sample size twelve

leaflets were taken from every palm from each of the north, east, south, and west directions and immediately transferred to the laboratory in polyethylene bags for inspection by the aid of stereo-microscope. The number of nymph and adult insects on 1 cm^2 area on a lower surface of date palm leaflets was counted and recorded together opposite to each inspected date. Concerning, the effect of the environmental resistance factors (physical and abiotic) on the total population of *P. blanchardii*. Fortnight meteorological data (temperature- maximum & minimum, relative humidity & total rainfall) was collected from meteorological unit of Agriculture Research Station, Bikaner.

RESULTS AND DISCUSSION

The correlation between scale population and abiotic factor was worked out during the present investigation that in 2017-18 and 2018-19 (Tables 1&2) and illustrated in figures 1 and 2. The scale population showed a significant negative correlation (r= -0.940 and r= -0.903) and (r= -0.850 and r= -0.811) with maximum and minimum temperatures, respectively. The scale population was a non-significant positive correlation (r= 0.457 and r= -0.013) with maximum and minimum relative humidity, respectively, during 2017-18 whereas, during 2018-19 scale population showed non-significant negative correlation (r= -0.057) with maximum relative humidity and significant negative correlation (r= -0.626) with minimum relative humidity. However, with rainfall scale population had non-significant negative correlation (r= -0.170) and (r= -0.151) 2017-18 and 2018-19, respectively. The present findings partially agree with that of IdderIghili *et al.* (2015) who reported that minimum temperature had a negative effect on population density, while high maximum temperature showed positive influence in date palm scale population fluctuations. Latifian and Zearea (2009) who reported that a significant correlation was observed between population dynamics and weather condition including temperature and relative humidity. El-Said (2000) who reported maximum temperature on *P. blanchardii* was highly significant positive in the first year and insignificant negative in the second year. Whereas, El-Said (2002) who reported a significant positive effect of mean relative humidity on scale population, whereas, a negative significant effect for first year and positive significant effect for second year of minimum temperature.

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Table- 1 Population of *P. blanchardii* in relation to abiotic factors during 2017-18

S. No	Month	Fort night	Temp(^{0}C)		R.H. (%)		Rainfall (mm)	Scale Insect Population/ cm^2
			Max	Min	Max	Min		
1	October 2107	I	39.67	20.20	51.20	18.20	0.00	13.67**
		II	37.87	16.64	47.31	22.50	0.00	14.67
2	November2017	I	32.84	14.19	70.73	28.00	0.09	18.00
		II	27.97	8.29	68.73	26.47	0.00	21.33
3	December 2017	I	25.14	8.33	64.20	35.13	0.13	24.33
		II	25.78	4.84	79.75	28.06	0.00	25.93
4	January 2018	I	24.87	4.45	78.93	27.33	0.00	26.72
		II	25.84	6.14	78.38	31.63	0.00	23.33
5	February 2018	I	26.57	8.00	66.87	25.53	0.00	19.99
		II	32.10	13.04	74.38	30.31	0.00	13.33
6	March 2018	I	34.03	15.96	59.13	22.00	0.09	16.33
		II	36.45	17.07	50.88	17.44	0.00	12.67
7	April 2018	I	39.54	21.85	46.33	20.47	0.28	11.67
		II	40.98	21.75	36.20	16.13	0.00	9.33
8	May 2018	I	42.69	26.71	41.47	21.47	0.37	10.33
		II	44.60	27.21	30.88	15.13	0.00	6.67
9	June 2018	I	43.92	30.15	55.47	25.73	0.77	5.18
		II	38.74	27.24	69.07	45.07	2.85	6.67
10	July 2018	I	40.39	29.52	80.40	41.27	0.96	11.67
		II	35.31	26.79	87.56	60.75	10.96	13.67
11	August 2018	I	36.15	26.83	86.80	48.93	0.68	12.67
		II	36.28	26.34	78.44	51.75	2.79	13.33
12	September 2018	I	35.58	25.28	73.73	47.13	0.00	12.67
		II	37.45	22.75	65.47	35.20	0.00	12.99
			-0.940*	-0.903*	NS	NS	NS	-

* Significant at 5% level
NS- Non-Significant
**Average of scale population on ten plants

Table- 2 Population of *P. blanchardii* in relation to abiotic factors during 2018-19

S. No	Month	Fort night	Temp(^{0}C)		R.H. (%)		Rainfall (mm)	Scale Insect Population/ cm^2
			Max	Min	Max	Min		
1	October 2108	I	37.91	20.34	55.80	20.40	0.00	13.21**
		II	35.44	16.89	54.31	22.88	0.00	15.21
2	November 2018	I	31.17	12.02	67.33	27.07	0.00	18.33
		II	30.49	10.81	71.80	27.73	0.05	20.87
3	December 2018	I	25.73	7.99	74.60	34.93	0.00	23.21
		II	23.67	2.17	75.94	28.63	0.00	24.85
4	January 2019	I	22.65	5.55	85.67	34.53	0.00	25.51
		II	21.56	6.19	84.94	39.00	0.17	23.28
5	February 2019	I	22.65	6.80	88.00	39.60	0.00	19.33
		II	24.42	8.85	77.08	36.85	0.00	13.91
6	March 2019	I	26.52	10.89	77.27	34.53	0.12	11.85
		II	34.15	15.10	62.81	33.75	0.00	10.25
7	April 2019	I	40.25	22.44	92.33	81.27	0.89	8.35
		II	38.94	22.70	82.80	71.93	1.17	7.85
8	May 2019	I	40.81	24.91	72.40	64.60	0.60	5.65
		II	41.93	25.84	72.06	43.00	0.00	5.27
9	June 2019	I	45.92	31.63	86.00	65.87	0.00	5.01
		II	40.96	27.14	85.73	67.67	0.85	4.33
10	July 2019	I	41.13	30.13	81.07	62.40	0.00	10.12
		II	38.51	27.27	73.94	48.38	2.54	13.11
11	August 2019	I	36.00	27.02	81.93	64.27	5.39	14.21
		II	36.56	26.37	86.31	63.50	2.96	12.25
12	September 2019	I	39.15	27.07	88.87	63.67	1.03	13.11
		II	36.87	24.85	86.00	58.07	0.05	13.33
			-0.850*	-0.811*	NS	-0.626*	NS	-

* Significant at 5% level
NS- Non-Significant
**Average of scale population on ten plants

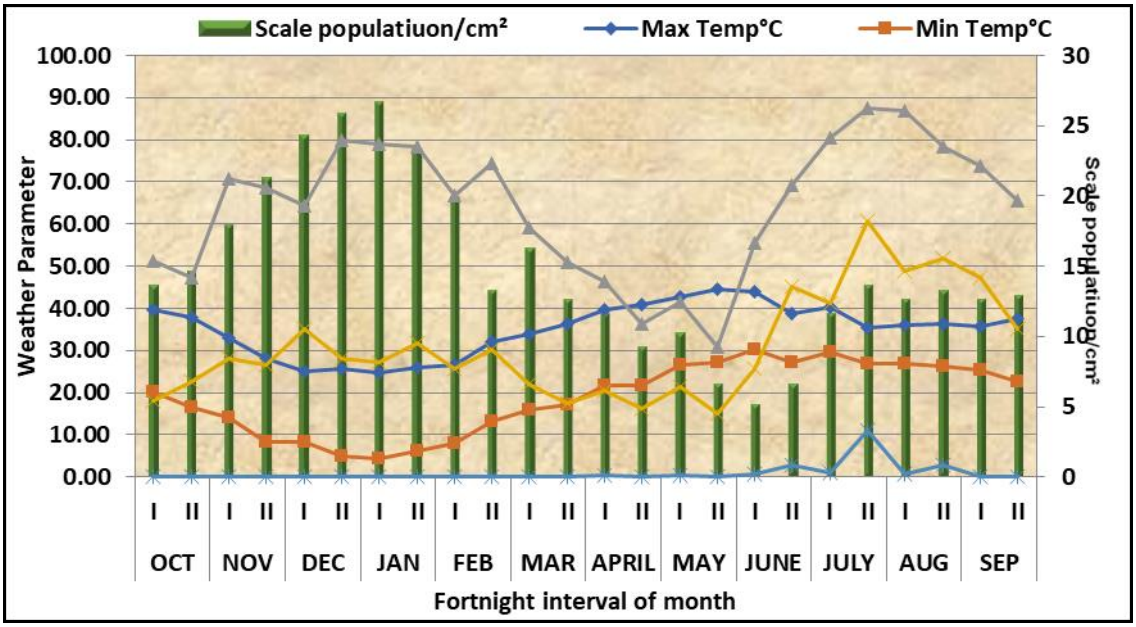

Fig- 1 Population of datepalm scale, *P. blanchardii* (Trag) in relation to abiotic factors during 2017-18

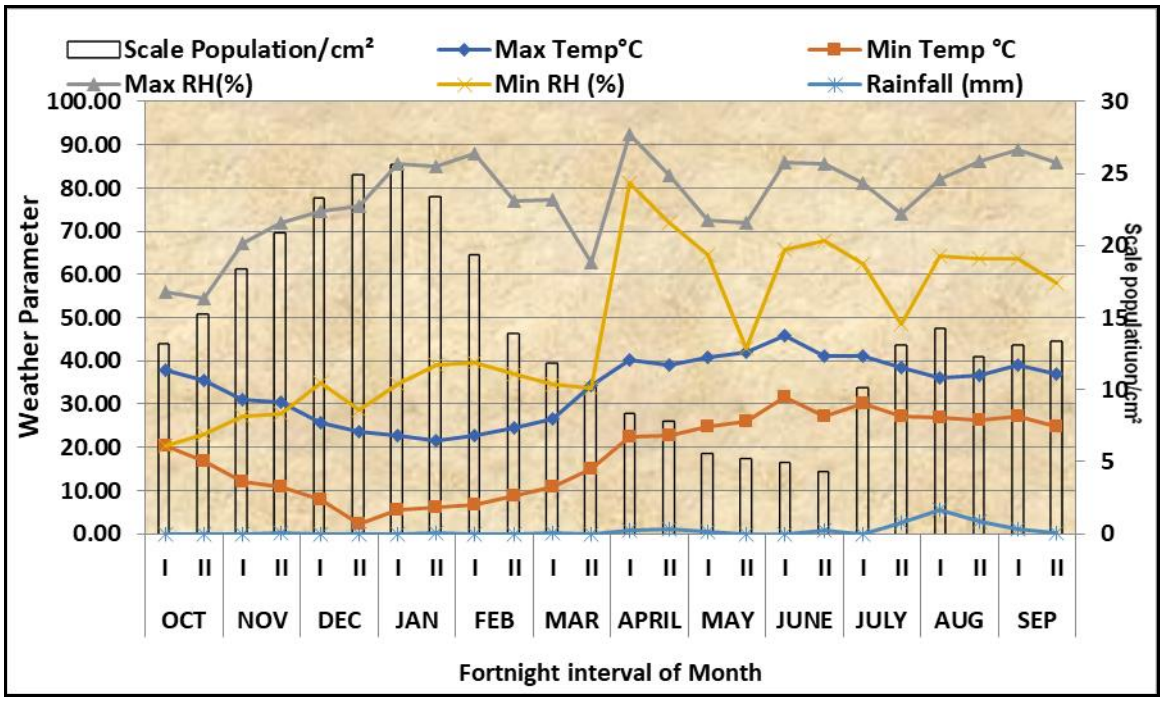

Fig- 2 Population of datepalm scale, *P. blanchardii* (Trag) in relation to abiotic factors during 2018-19

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