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Population Fluctuation of Bihar Hairy Caterpillar, *Spilarctia obliqua* (Walker) and its Natural Enemies on Castor Under Semi-Arid Conditions of Gujarat, India

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ABSTRACT: Bihar hairy caterpillar, *Spilarctia obliqua* (Walker), is a polyphagous lepidopteran pest, known to cause substantial damage to a wide range of agricultural and horticultural crops. In recent years, its occurrences have become increasingly severe in castor (*Ricinus communis* L.) cultivation in Western India. Therefore, to study the seasonal incidence and damage potential, a study was undertaken on castor (GCH-8) during *Kharif,* 2024-25, at the Centre for Oilseeds Research, S. D. Agricultural University, Sardarkrushinagar. The results revealed that peak larval incidence (43.52 larvae/plant) was observed during the 45th SMW, coinciding with maximum foliar damage (58.44%) during the 44th SMW. The larval parasitoid, *Cotesia ruidus* (Wilkinson), was recorded from natural field infestations in castor. The highest population (1.60 spiders/plant) of spider (adult and spiderling) was recorded at 49th SMW, and the maximum (1.00 coccinellids/plant) coccinellids (adults) were recorded during 44th SMW, and the maximum population of *Chrysoperla* (1.40 Chrysoperla/plant) was recorded during 44th SMW. Multiple regression analysis revealed that abiotic factors had a strong influence on pest incidence, particularly larval population (R^2 = 0.66) and leaf damage (R^2 = 0.61) while, natural enemies showed weak to moderate relationships (R^2 = 0.18–0.45), indicating a greater role of abiotic factors.

Keywords: *Spilarctia obliqua*, Castor, Population dynamics, Parasitoid, Natural enemies, Regression

1. INTRODUCTION

An important non-edible oilseed crop of the spurge (Euphorbiaceae) family, castor (*Ricinus communis* L.), is thought to have originated in Ethiopia. Because it does not compete with food crops or food-grade oils, requires only moderate rainfall, and places low demands on soil fertility, it is widely distributed throughout the tropics and subtropics. It also adapts well to the world's temperate climates. Long used as a lubricant, castor oil and its derivatives are widely used in a variety of industries, including the pharmaceutical, paper, textile, chemical, plastics, grease, hydraulic, brake fluid, paint, varnish, linoleum, plasticisers, soap, cosmetics, and even the electronics and telecommunications sectors. Additionally, it is employed in the production of synthetic leather. Cosmetics and allied items employ it because of its ability to unclog (Sumit, 2013). Due to high nitrogen content (4.5%), it is utilised as organic manure in agriculture. In addition to being used as fuel or thatching material, the stalks of the castor plant are also used to make paper pulp for writing, printing, and wrapping. Castor cake is used as manure once the oil from the seeds has been extracted.

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Along with a few minerals, it contains potassium (1%), phosphoric acid (2.5%), and nitrogen (6.4%) (Tomar *et al*., 2017). On castor, about 100 insect pests are known to occur, including sucking insects and leaf feeders (Basappa & Lingappa, 2001). Defoliators such as semilooper, *Achaea janata* L.; tobacco caterpillar, *Spodoptera litura* Fab.; capsule borer, *Conogethes punctiferalis* Guen; and Bihar hairy caterpillar, *Spilarctia obliqua* (Walker) are the main pests affecting castor. Additionally, sucking pests such as leaf hoppers, *Empoasca flavescens* Fab., whiteflies, *Trialeurodes ricini* Misra thrips, *Retithrips syriacus* Mayet (Lakshminarayana & Raoof, 2005) and *Scirtothrips dorsalis* Hood (Chaudhary et al., 2023b) attack at various stages of growth. Among them, the Bihar hairy caterpillar, *S. obliqua*, a polyphagous pest, is seriously harming several important crops. In India, it is reported to attack 126 plant species across more than 24 plant families, including several commercially significant plants such as pulses, grains, cereals, and oilseeds (Singh et al., 2004). In recent years, ecological-based pest management strategies have gained increasing importance due to their sustainability and environmental safety. In this context, regular field monitoring forms the backbone of any effective pest management programme, as it helps understand pest incidence, distribution, and population dynamics in the crop. Seasonal incidence studies are particularly useful for planning need-based plant protection strategies, as they indicate the exact peak activity periods and pest-free intervals of major insect pests. The population of insect pests in castor is influenced by various abiotic factors, such as temperature, relative humidity, and rainfall, as well as biotic factors, including natural enemies and other biological control agents. Therefore, the present study was undertaken to assess the effect of abiotic factors on the incidence and population dynamics of insect pests on castor.

2. MATERIALS AND METHODS

2.1. Experimental Site and Season

A dynamics study was carried out during *Kharif*, 2024-25 at Centre for Oilseeds Research, S. D. Agricultural University, Sardarkrushinagar, located at Jorapura Farm in Gujarat, India. The experimental site lies at an elevation of 116.56 meters above sea level, positioned at 24°32′ North latitude and 72°28′ East longitude. The region experiences a sub-tropical, semi-arid climate, characterised by extremely hot and humid summers. The average annual temperature ranges from 19.2°C to 33.8°C, with an average annual rainfall of 940 mm (Anonymous, 2025).

2.2. Experiment Details

Castor hybrid GCH-8 was sown during the 2nd week of July, which was raised as per the local package of practices without any insecticidal sprays. The castor hybrid GCH 8 was grown in an area of 180 m^2 at a spacing of 150 cm × 120 cm.

2.3. Observations Procedure

Observations were recorded on five plants selected at each location in the plot, and from five locations, 25 plants were selected. The meteorological data during the crop period were used to determine the correlation of insect pest population with weather parameters.

2.4 Statistical Analysis

Starting from the larvae's first appearance until the crop was harvested, weekly observations of the *Spilarctia obliqua* larval population and leaf damage percentage were recorded every week. Analysis was carried out using the number of larvae per plant and associated leaf damage. Microsoft Excel (version 2019) was used to organise all data collected during the study period, and IBM SPSS Statistics (version 32) was used for analysis. Pest population (larvae per plant) and leaf damage percentage were the dependent variables, and weather parameters like maximum and minimum temperatures, morning and evening relative humidity, evaporation, rainfall, wind speed, and hours of bright sunshine were the independent variables. The degree and direction of the relationship between the pest population and specific weather variables were ascertained using the correlation coefficient (r). The significance of the correlation coefficient was examined at the 1% and 5% significance levels (Pearson, 1895). The coefficient of determination (R^2) was used to assess the regression model's quality of fit, and the significance of the regression coefficients was examined at the 5% probability level.

3. RESULTS AND DISCUSSION

3.1. Bihar Hairy Caterpillar

The adult female deposited eggs in clusters on the bottom and upper surface of the leaf epidermis. While the gregarious juvenile caterpillars feed on soft, green tissues, giving the appearance of a net or web, the older larvae skeletonise the leaves (Figures 1a and1b). The data from Figure 2 revealed that the larval population of the Bihar hairy caterpillar appeared during the third week of September (37th SMW) and persisted until the third week of January (3rd SMW). Initially, its population was low (13.22 larvae/plant), which gradually increased in its numbers and attained a peak level (43.52 larvae/plant) during the 2nd week of November (45th SMW). Thereafter, larval population steadily decreased

Figure 1. (a) Gregarious larvae feeding on the leaves

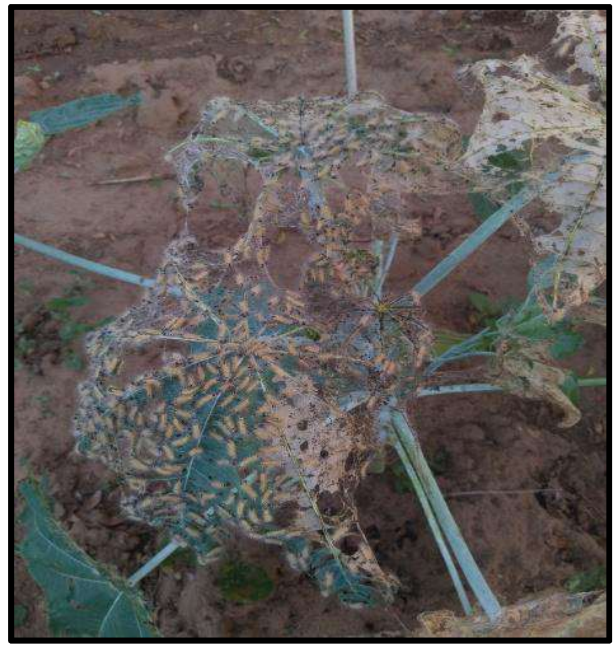

Figure 1. (b) Skeletonization of leaf lamina

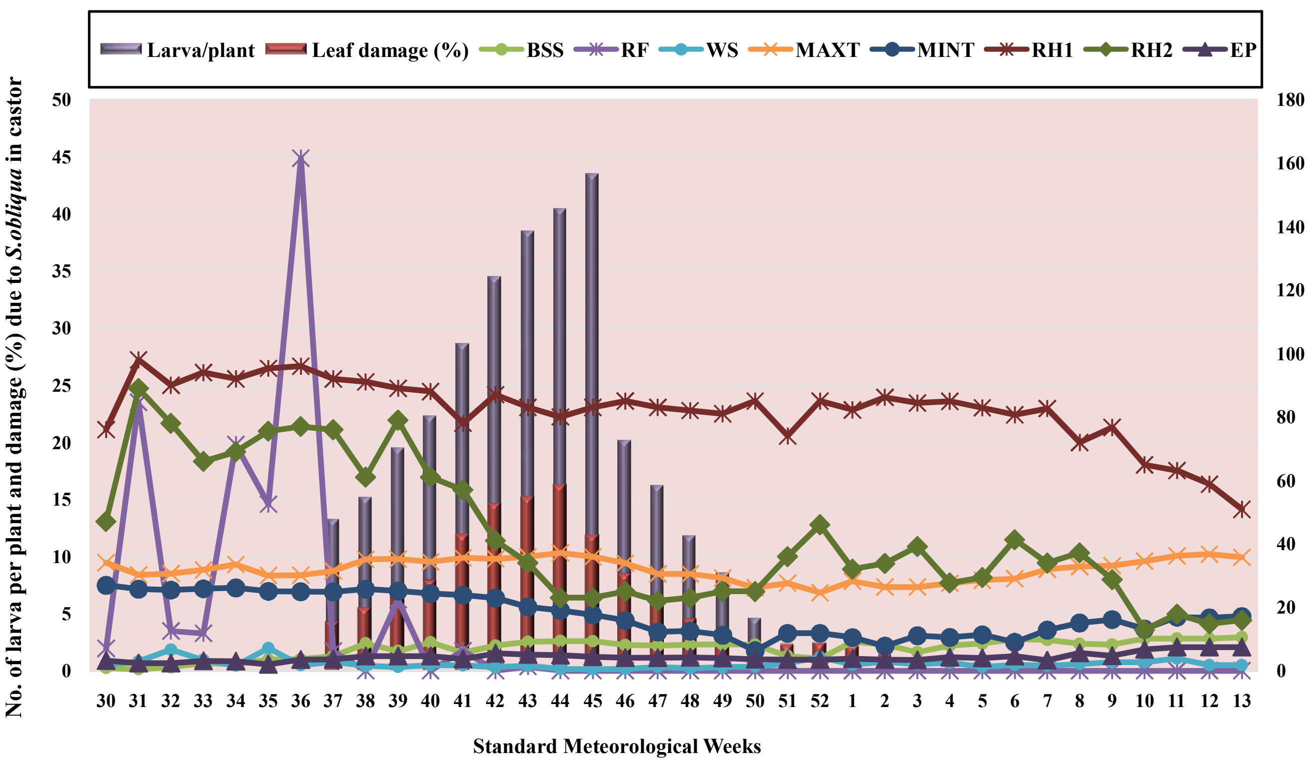

Figure 2. The incidence of *S. obliqua* larvae and corresponding leaf damage in association with prevailing abiotic factors during *Kharif* 2024

from the 46th SMW (20.14 larvae/plant) to the 3rd SMW (0.24 larvae/plant). During the 39th to 44th SMW, *S. obliqua* larvae were found most active with their maximum larval population. The data on leaf damage (%) were directly associated with the larval population. Damage was observed from the 37th standard meteorological week (3rd week of September) to the 1st standard meteorological week (1st week of January). As the larval population increased, the damage also increased in castor. The leaf damage was 15.22% at the initial appearance, with peak damage (58.44%) recorded during the 44th standard meteorological week (1st week of November), which also coincided with the maximum larval population. The correlation coefficient analysis revealed that the larval population and leaf damage (%) had highly significant positive correlations with maximum temperature (r=0.553**, r=0.475**, respectively). In contrast, the minimum temperature had a less significant positive correlation (r=0.285*, r=0.195). Wind speed (r= -422*, r= -0.455**) showed a significant negative correlation, while rainfall (r= -0.182, r= -0.226) showed a negative but non-significant correlation. Other abiotic factors, such as morning relative humidity (r= 0.125, r= 0.121), evaporation (r= 0.136, r= 0.120), and bright sunshine hours (r= 0.244, r= 0.255), showed positive but non-significant correlations with larval population and leaf damage (%). The larval population showed a moderate level of association with weather parameters, with a coefficient of determination (R^2) of 0.66. Among the variables, positive effects were observed for X_1, X_4, X_5, and X_6, indicating that these factors favoured larval buildup, whereas X_2, X_3, X_7, and X_8 had negative effects. This suggests that specific climatic conditions play a crucial role in regulating larval dynamics. Leaf damage also showed a similar trend, with an R^2 of 0.61, indicating that the selected abiotic factors explained 61% of the variation. Positive contributions from X_4, X_5, and X_6 indicated their role in enhancing crop damage, while other variables showed a suppressive effect (Table 3). Similarly, Gaur (2014) observed that the hairy caterpillar appeared on castor during the 35th SMW. Patel and Patel (2015) recorded the abundance of *S. obliqua* on castor. They revealed that the pest was active on the castor crop from the 4th week of September to the 3rd week of November, with the highest activity occurring from the 2nd week of October to the 3rd week of November. Patel et al. (2016) found that the gregarious larval population first appeared on the crop (42.7 larvae/plant) during the 33rd SMW (3rd week of August) and was recorded on the crop till the 42nd SMW (3rd week of October). Further, Chaudhary (2023a) indicated that the Bihar hairy caterpillar appeared on castor crop during the 40th SMW and remained active up to the 49th SMW. Patel et al. (2024) also observed that the Bihar hairy caterpillar was first recorded on mung beans during the 32nd standard week (1.92 larvae/plant), which reached its maximum during the 41st standard week (11.93 larvae/plant). Present findings on the correlation of weather parameters are closely related to Patel and Patel (2015), who studied the seasonal abundance of *S. obliqua* on castor and showed that there is a highly significant negative correlation with wind speed, minimum temperature, morning and evening relative humidity and morning as well as evening vapour pressure, while a significant positive correlation with maximum temperature. Further, studies by Patel et al. (2016) on the seasonal abundance of S. obliqua across various oilseed crops and correlation analysis revealed that minimum temperature had a significant positive association with the number of larvae (r = 0.612*). Also, Shivakumara et al. (2024) reported that the maximum temperatures (-0.52 and -0.49) were negatively correlated with per cent pest incidence and larval population. Meena et al. (2024) found that the infestation of *S. obliqua* on black gram was negatively correlated with rainfall (r = -0.55) and positively correlated with minimum temperature (r = 0.33) and morning relative humidity (r = 0.33).

3.2. Natural Enemies

3.2.1. Spiders

The spider population began in the 2nd week of August (32nd SMW) at 0.20 spiders per plant (Table 1). The data is shown in the Figure 3 revealed that the population steadily increased to a maximum level (1.60 spiders/plant) during the 2nd week of December (49th SMW). Thereafter, the spider population declined (0.52 spiders/plant) in the 5th week of December (52nd SMW). The data on spiders depicted in Table 2 indicated that bright sunshine hours (r = 0.159) and morning relative humidity (r = 0.124) showed positive and non-significant correlations. Whereas rainfall, wind speed, maximum temperature, minimum temperature, evening relative humidity, and evaporation (r = -0.117, r = -0.166, r = -0.125, r = -0.243, r = -0.203, r = -0.066) show negative and non-significant correlations with the spider population. In contrast, the spider population exhibited a very low coefficient of determination (R^2 = 0.18), indicating a weak dependence on the weather parameters considered. This suggests that spider abundance may be influenced more by prey availability and ecological interactions rather than abiotic factors alone (Table 3). These studies are in line with Reddy (2002), who reported that the spider was found predominant in November-sown castor crop among all three sowings at Guntur (Andhra Pradesh). Shambhavi et al. (2023) also recorded the population of spiders on castor crop during the 27[th] SMW (vegetative stage of the crop) with a population of 0.20 spiders per plant and maximum activity during the 35[th] SMW (maturity stage of the crop) with a population of 0.29 spiders per plant. Further, Chaudhary (2023a) noted that the spider population on castor during the

Table 1. Population dynamics of Bihar hairy caterpillar infesting castor during *Kharif* 2024-25

Months	Weeks	SMW	Number of larva(e)/ plant	leaf damage (%)/ plant	No. of Spiders /plant	No. of Coccinellids /plant	No. of *Chrysoperla* /Plant
July, 2024	4	30	0.00	0.00	0.00	0.00	0.00
August, 2024	1	31	0.00	0.00	0.00	0.00	0.00
	2	32	0.00	0.00	0.20	0.00	0.00
	3	33	0.00	0.00	0.20	0.00	0.00
	4	34	0.00	0.00	0.80	0.42	0.20
September, 2024	1	35	0.00	0.00	0.60	0.80	0.40
	2	36	0.00	0.00	0.40	0.40	0.20
	3	37	13.22	15.22	0.20	0.60	0.62
	4	38	15.16	19.62	0.80	0.40	0.80
	5	39	19.54	23.84	0.80	0.82	0.40
October, 2024	1	40	22.32	28.44	0.40	0.80	0.40
	2	41	28.62	42.82	0.80	0.40	0.82
	3	42	34.54	52.64	1.20	0.88	0.86
	4	43	38.42	54.66	1.40	0.80	1.20
November, 2024	1	44	40.42	58.44	1.20	1.00	1.40
	2	45	43.52	52.60	0.64	0.82	1.22
	3	46	20.14	30.42	0.40	0.84	0.82
	4	47	16.20	22.48	0.82	0.20	0.20
December, 2024	1	48	11.82	16.24	1.22	0.40	0.44
	2	49	8.60	10.28	1.60	0.20	0.28
	3	50	4.56	8.24	1.20	0.20	0.24
	4	51	1.58	8.66	1.40	0.42	0.22
	5	52	0.52	7.56	0.52	0.60	0.62
January, 2025	1	1	0.68	4.84	0.32	0.20	0.80
	2	2	0.42	0.00	0.36	0.20	0.20
	3	3	0.24	0.00	0.20	0.00	0.20
	4	4	0.00	0.00	0.40	0.00	0.20
February, 2025	1	5	0.00	0.00	0.20	0.00	0.00
	2	6	0.00	0.00	0.20	0.00	0.00
	3	7	0.00	0.00	0.40	0.00	0.00
	4	8	0.00	0.00	0.80	0.00	0.00
March, 2025	1	9	0.00	0.00	0.60	0.00	0.00
	2	10	0.00	0.00	0.60	0.00	0.00
	3	11	0.00	0.00	0.00	0.00	0.00
	4	12	0.00	0.00	0.00	0.00	0.00
	5	13	0.00	0.00	0.00	0.00	0.00

SMW: Standard Meteorological Week

38th SMW remained active up to the 12th SMW. Its population ranged from 0.05 to 1.80 adults per plant, with the highest observed during the 4th SMW (1.80 adults/plant), indicating its activity from September to March. There was a slight variation in the population occurrence of spiders due to environmental conditions, as well as variation in the pest population.

3.2.2. Coccinellids

The data presented on the incidence of coccinellids in Table 1 and graphically depicted in Figure 3 revealed that the adult population of coccinellids ranged between 0.20 and 1.00 per plant. Coccinellids were found active on castor from the 4th week of August to the 3rd week of January (34th to 3rd SMW), with 0.42 coccinellids per plant. The population increased gradually and reached a maximum level of 1.00 coccinellids per plant during the 1st week of November (44th SMW) and thereafter declined and reached a lowest level (0.20 coccinellids/plant) during the 2nd week of January (2nd SMW). The data on coccinellids presented in Table 2 revealed that morning relative humidity (r = 0.368*) showed a positive and significant correlation. Maximum temperature (r = 0.237), minimum temperature (r = 0.293), bright sunshine hours (r = 0.004), rainfall (r = 0.052), and evening relative humidity (r = 0.193) showed positive and non-significant correlations with coccinellids. Wind speed (r = -0.183) and evaporation (r = -0.129) showed negative but non-significant correlations with the coccinellid population. Coccinellids showed a moderate relationship (R^2 = 0.37), with a slight positive influence from X_1 and X_6, while most other variables had negligible or negative effects. This indicated limited but notable climatic influence on their population (Table 3). The study conducted by Chaudhary (2023a) revealed that ladybird beetles on castor appeared during the 41st SMW and remained active up to the 11th SMW. Its population ranged from 0.05 to 1.40 adults per plant, with the highest observed during the 10th SMW (1.40 adults/plant).

3.2.3. Green lacewing, *Chrysoperla zastrowi sillemi* (Esben-Petersen)

The green lacewing population began in the 4th week of August (34th SMW), with 0.20 *Chrysoperla* per plant (Table 1 and Figure 3). The population steadily increased and reached a maximum level (1.40 *Chrysoperla* per plant during the 1st week of November (44th SMW). Thereafter, a

Table 2. Correlation between larval population and natural enemies with weather parameters during *Kharif* 2024-25

Weather parameters	No. of *S. obliqua* larvae /plant	Leaf damage (%)	No. of spiders/plant	No. of Coccinellids/plant	No. of *Chrysoperla*/plant
Maximum temperature (Max. T) °C	0.553**	0.475**	-0.125	0.237	0.256
Minimum temperature (Min. T) °C	0.285*	0.195	-0.243	0.293	0.107
Morning relative humidity (M. RH) %	0.125	0.121	0.124	0.368*	0.256
Evening relative humidity (E. RH) %	-0.029	-0.097	-0.203	0.193	-0.049
Evaporation (EP) mm	0.136	0.120	-0.066	-0.129	-0.039
Rainfall (RF) mm	-0.182	-0.226	-0.117	0.052	-0.154
Wind speed (WS) $kmhr^{-1}$	-0.422*	-0.455**	-0.166	-0.183	-0.315
Bright sunshine (hours/days)	0.244	0.255	0.159	0.004	0.200

* Significance at 5 per cent level of significance ('r'= 0.330); ** Significance at 1 % level of significance ('r'=0.424)
n=36 week

Table 3. Multiple regression equation of *S. obliqua* with leaf damage and natural enemies of castor with various environmental factors infesting castor

Pest and natural enemies	Multiple regression equation	Coefficient of determination R^2
Larvae	$Y= - 139.36+0.28X_1-0.112X_2-2.11X_3+2.58X_4+0.09X_5+0.95X_6-0.19X_7-0.52X_8$	0.66
Leaf damage	$Y= - 114.74-0.38X_1-0.19X_2-3.92X_3+2.11X_4+1.10X_5+0.97X_6-0.43X_7-1.60X_8$	0.61
Spiders	$Y= - 0.497-0.03X_1-0.00X_2-0.01X_3+0.00X_4+0.00X_5+0.02X_6-0.01X_7-0.01X_8$	0.18
Coccinellids	$Y= - 1.251+0.02X_1-0.00X_2-0.03X_3-0.00X_4+0.00X_5+0.01X_6-0.00X_7-0.03X_8$	0.37
Chrysoperla	$Y= - 2.246+0.03X_1-0.00X_2-0.03X_3+0.01X_4+0.03X_5+0.02X_6-0.01X_7-0.06X_8$	0.45

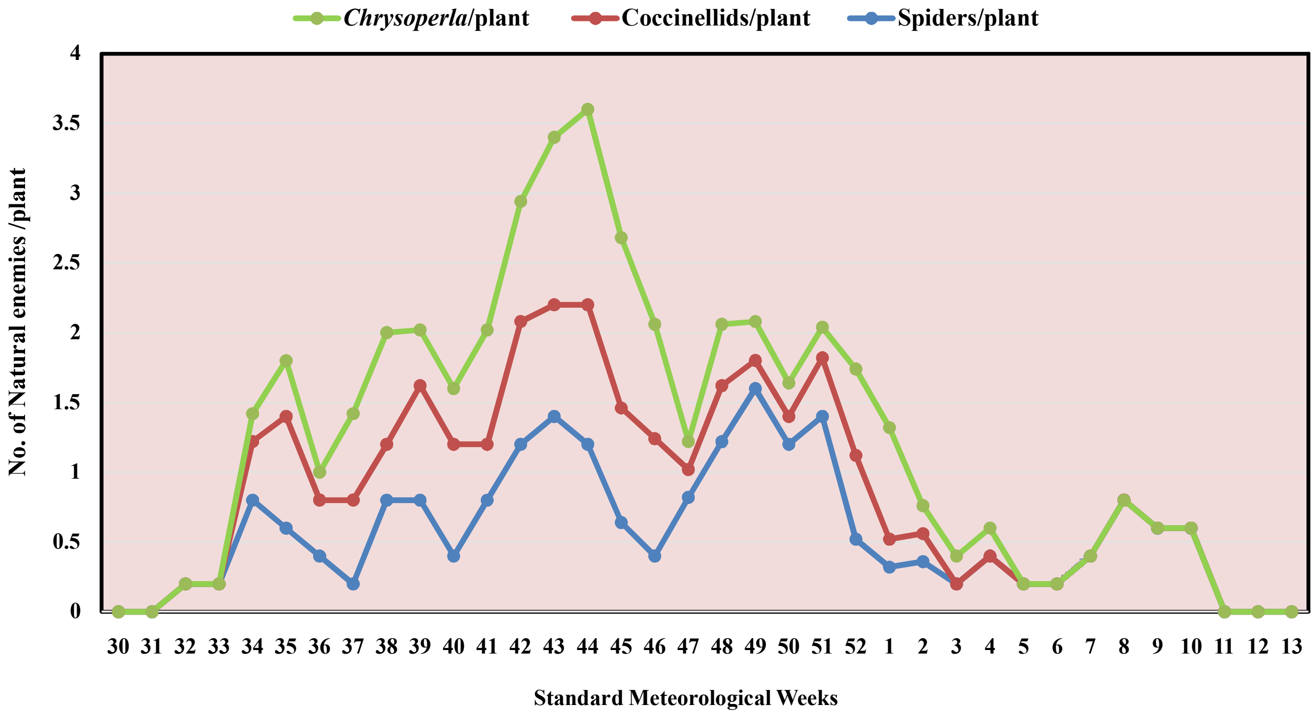

Figure 3. The abundance of natural enemies (spiders, coccinellids, and *Chrysoperla*) during various SMW on castor during *kharif* 2024

low population of *Chrysoperla* was noticed and declined (0.20 *Chrysoperla* /plant) by the 4th week of January (4th SMW). The data on *Chrysoperla* (Table 2) indicated that maximum temperature (r = 0.256), minimum temperature (r = 0.107), morning relative humidity (r = 0.256), and bright sunshine hours (r = 0.200) showed positive but non-significant correlations. Rainfall (r = -0.154), wind speed (r = -0.315), evening relative humidity (r = -0.049), and evaporation (r = -0.039) had negative and non-significant correlations with the *Chrysoperla* population (Table 3). Similarly, the *Chrysoperla* population showed a moderate association (R^2 = 0.45), indicating that abiotic factors accounted for nearly 45% of the population's variation. Positive contributions from X_1, X_4, X_5, and X_6 indicate favourable conditions for their activity, while negative coefficients for X_3, X_7, and X_8 suggest adverse effects. Similarly, Reddy (2002) reported that *Chrysoperla* sp. was predominant in the November-sown castor crop among the three sowings at Guntur (Andhra Pradesh). Further, Chaudhary (2023a) observed that *Chrysoperla* appeared on the castor crop during the 39th SMW and remained active up to the 12th SMW. Its population ranged from 0.43 to 1.90 adults per plant, with the highest observed during the 44th SMW (1.90 adults/plant), and its activity occurs from September to March.

Overall, the results indicated that abiotic factors had a stronger influence on pest populations (larvae and leaf damage) compared to natural enemies. Natural enemy populations were less dependent on weather variables and may be more regulated by biotic factors such as prey density and habitat conditions. These findings are consistent with earlier studies that reported that pest incidence is more directly influenced by climatic factors, whereas natural enemies respond to both climatic and ecological cues.

4. CONCLUSION

The study confirms that *Spilarctia obliqua* is a major defoliator of castor, with its incidence closely regulated by seasonal climatic conditions. Temperature emerged as a key driver of pest buildup, while rainfall and wind exerted a suppressive effect, underscoring the dominant role of abiotic factors in shaping pest dynamics. The occurrence of natural enemies, including spiders, coccinellids, and *Chrysoperla zastrowi sillemi*, highlights their ecological significance, with their abundance largely influenced by prey availability and, to a lesser extent, by weather variables. Overall, the findings emphasise the importance of integrating weather-based pest monitoring with biological control components for developing reliable forecasting systems. This approach can support timely, eco-friendly integrated pest management strategies for the sustainable management of *S. obliqua* in castor. Further studies over multiple seasons are required to confirm the consistency of the observed seasonal incidence patterns of the Bihar hairy caterpillar on castor.

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CRediT authorship contribution statement

Parmar Dhruv N. Performed the experiments; drafted the manuscript. **Chandaragi MK:** Designed the research, revised the manuscript. **Koosi Sai Thilak:** Reviewing and editing

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Conflict of interest

The authors have no conflicts of interest to declare.

Data availability statement

The data supporting the findings of this study are available within the article.

Statement on generative AI and AI-assisted technologies in the writing process

The authors declare that no artificial intelligence tools were used to write this manuscript.

REFERENCES

Anonymous. (2025). *Accuweather, Dantiwada, Gujarat*. https://www.accuweather.com. Accessed 11 Mar 2025.

Basappa, H., & Lingappa, S. (2001). Studies on off-season activity and carry-over of castor semilooper, *Achaea janata* Linn. (Lepidoptera: Noctuidae). *Indian Journal of Plant Protection, 29*(1/2), 74-78.

Chaudhary, D.M. (2023a). *Pest succession, host plant resistance and management of sucking pests of castor (Ricinus communis Linnaeus).* Ph.D. (Agri.) Thesis submitted to Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, India.

Chaudhary, F.K., Chandaragi, M. K., Tejani, D. N., Parmar, L.D., Gangwar, G.P., Jat, A.L., Patel, A.M., & Patel, J.R. (2023b). Evaluation of efficacy of different concentrations of newer insecticides against thrips, *Scirtothrips dorsalis* Hood (Thysanoptera: Thripidae) infesting castor. *Journal of Oilseeds Research*, 40(1–2), 83-88.

Lakshminarayana, M., & Raoof, M.A. (2005). Insect pests and diseases of castor and their management-Directorate of Oilseeds Research, Hyderabad, 78.

Meena, M.S., Meghwal, H.P., Saini, L.S., Parmar, D., & Saini, D.K. (2024). Seasonal occurrence of Bihar hairy caterpillar and tobacco caterpillar on black gram under unsprayed conditions. *Biological Forum – An International Journal, 16*(5), 78-80.

Patel, P.K., Kumar, P., Kumar, A., & Kumar, V. (2024). Effect of weather parameters on population dynamics of Bihar hairy caterpillar [*Spilarctia* (*Spilosoma*) *obliqua* Walker] in mungbean [Vigna radiata (L.) Wilczek]. *International Journal of Environment and Climate Change*, *14*(2), 161-166.

Patel, R.J., & Patel, C.C. (2015). Seasonal abundance of Bihar hairy caterpillar, *Spilosoma obliqua* Walker, in castor. *Trends in Biosciences*, *8*(16), 4151-4154.

Patel, R.J., Desai, V.H., Patel, C.C., & Thumar, R.K. (2016). Seasonal Abundance of Bihar Hairy Caterpillar, *Spilosoma obliqua* Walker on Oilseed Crops. *Advances in Life Science*, *5*(7), 2849-2458.

Pearson, K. (1895). Note on regression and inheritance in the case of two parents. *Proc. R. Soc.,* 58(347-352), 240-242.

Gaur, R.K. (2014). Diversity of insect pests of castor, Ricinus communis L and their ecological interaction in south-west Haryana. *International Journal of Farm Sciences*, *4*(4), 147-152.

Reddy, N.T. (2002). *Seasonal incidence and chemical control of rabi castor pest complex* (Doctoral dissertation, ANGRAU ACH: ENTOMOLOGY).

Shambhavi, H.T., Srinivas Reddy, K.M., Yamanura, M.K.R., Reddy, K., & Katteppanavar, A.D. (2023). Population dynamics of insect pests of castor. *The Pharma Innovation Journal, 12*(5), 112-118.

Shivakumara, K.T., Keerthi, M.C., Polaiah, A.C., Yogeesh, K.J., Venkatesan, T., Suthar, M.K., & Saran, P.L. (2024). First report of Bihar hairy caterpillar, Spilarctia obliqua Walker (Lepidoptera: Erebidae), infesting sweet basil in India. *International Journal of Pest Management*, *70*(3), 542-553.

Singh, Y.R., Singh, M.I., & Varatharajan, R. (2004). Bio-efficacy of IGRs against caterpillars of *Spilarctia obliqua*. *Annals of Plant Protection Sciences, 12*(1), 198-199.

Sumit, K. (2013). Seasonal abundance and field life-tables of *Achaea janata* (Linnaeus) and *Dichocrocis punctiferalis* (Guenee) infesting castor cultivars. M.Sc. (*Agri.*) Thesis submitted to College of Agriculture, Latur Marathwada Krishi Vidyapeeth, Parbhani.

Tomar, R.S., Parakhia, M.V., Rathod, V.M., Thakkar, J.R., Padhiyar, S.M., Thummar, V.D., & Golakiya, B.A. (2017). Molecular mapping and identification of QTLs responsible for charcoal rot resistance in Castor (*Ricinus communis* L.). *Industrial Crops and Products*, *95*, 184-190.