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Short communication

Incidence of insect pest damage in castor in relation to meteorological parameters in the scarcity zone of Maharashtra

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In India, castor (*Ricinus communis* L.*)* is grown mainly under rain fed conditions over an area of 7.13 lakh ha with the annual production of 8.50 and 3.36 lakh MT of castor seed and oil, respectively which accounts for 53 percent of area and 73 percent production of the world. During 2011-12, the castor seed production in the country attained its peak of 23.15 lakh tones from 12.78 lakh ha area which helped to earn foreign currency Rs. 3,805 crores through export of castor oil (Narvekar and Sheth, 2012).

Castor is grown in areas where mean monthly temperature across growing season ranges from 22.7 to34.3 ^{0}C. These temperatures are favorable for the castor insect pests. The sky cover during *kharif* (rainy) season (June to October) favours faster development of lepidopterous pests and is also responsible sometimes for their severe outbreak.

Insect pests such as defoliators *viz.,* red hairy caterpillar (*Amsacta moorei* Butler), semilooper (*Achoea janata* L.*)* tobacco caterpillar (*Spodoptera litura* F.) and shoot and capsule borer (*Conogethes punctiferalis* Guen.) were reported as major pests of castor and recently, serpentine leaf miner *(Liriomyza trifoli* Burgess) has become a serious one (Lakshminarayana, 2010). Castor crop was also damaged by sucking pests complex *viz.,* leaf hopper (*Empoasca flavescens* Fabr.), white fly (*Trialeurodes ricini* Misra) and thrips (*Retithrips syriacus* Mayet) causing typical "hopper burn" symptoms. Yield loss of 19 to 85 per cent has been reported in castor due to semilooper and capsule borer (Sing *et al.,* 1992). In Maharashtra, Gaikwad and Bilapate (1992) recorded 36.36 % reduction in castor leaves, 26.35 % in branches per plant, 21.32 % in capsules per branch and 19.58 % reduction in seed yield in unprotected plots as compared to the plots protected with insecticides. The present investigation was planned to study the effect of meteorological parameters on the development of important pests of castor and advise the farmers on need-based pesticide sprays.

The field experiments were conducted at Zonal Agriculture Research Station, Solapur, Maharashtra, India for five consecutive *kharif* seasons from 2009-10 to 2013-14 with three replications in plots 5.60 × 3.60 m^2 each. The castor crop (cv. Aruna) was sown on 22.08.09, 22.06.10, 10.07.11, 17.07.12 and 28.06.13. Planting during 2009-10 was delayed due to late receipt of monsoon. The castor insect pests were monitored and the infestation was recorded at weekly intervals from 10 days after sowing.

The major insect pests of castor considered in the study were semilooper (*Achoea janata*), tobacco caterpillar (*Spodoptera litura*), hairy caterpillar (*Spilosoma obluqua*), shoot and capsule borer (*Conogethes punctiferalis*), leaf miner (*Liriomyza trifolii*), leaf hoppers (*Empoasca flavescens*), thrips (*Retithrips syriacus*) and white fly (*Trialeurodes ricini*). The data on monthly meteorological parameters *viz.,* maximum and minimum temperatures, relative humidity (morning and afternoon) , rainfall, number of rainy days, evaporation and sunshine hours from June to December were collected from auto-weather station at Zonal Agriculture Research Station, Solapur.

The peak activity period (monthly average) of different castor insect pests during *kharif* 2009-10 to 2013-14 in Solapur region and the congenial weather conditions for the development of insect pests of castor are presented in Table 1and 2, respectively.

Peak activity of different insect pests of castor

The peak activity period of different castor pests ranged from July to December in the scarcity zone of Maharashtra (Table 1). Amongst the various insect pests, the sucking insect's complex *viz.,* leaf hoppers, thrips and white flies remained active during July to October with a peak activity during August to September. The leaf miner was also active during July to October with a peak activity during August to September. The castor semilooper remained active during July to November with a peak activity during August

Table1: The peak activity period (monthly) of castor insect pests during *Kharif* 2009-10 to 2013-14 in the scarcity zone of Maharashtra.

Crop Year	Sowing Dates	Leaf miner	Leaf hopper	Thrip	White fly	Semilooper	Tobacco caterpillar	Hairy caterpillar	Shoot and capsule borer
2009-10	22.08.2009	Sept>Oct.	October	Sept>Oct.	Sept>Oct.	Sept>Oct>Nov.	——-	——-	Dec>Jan>Feb.
2010-11	22.06.2010	July>Aug.	July>Aug.	July	July>Aug>Sept.	July>Aug.	July>Aug.	July>Aug.	Oct>Nov>Dec.
2011-12	10.07.2011	July>Aug>Sept.	Aug>Sept.	——-	Aug>Sept.	Aug>Sept.	——-	——-	Oct>Nov>Dec.
2012-13	17.07.2012	July>Aug.	Sept>Oct.	Sept>Oct.	Sept>Oct.	Aug>Sept.	——-	——-	——-
2013-14	28.06.2013	Aug>Sept.	July>Aug.	July>Aug.	July>Aug.	July>Aug.	July>Aug.	July>Aug.	Oct>Nov>Dec.

Table 2: Climate normals for insect pests of castor.

Sr. No.	Insect Pests	Max temp.	Min temp	Optimum temp.	RH-I	RH-II	Sunshine hour
1.	Leaf miner	33 ^{0}C	22 ^{0}C	-	84 to 88 %	55 to 60 %	-
2.	Leaf hoppers	31 to 33 ^{0}C	20 to 22 ^{0}C	24 to 30 ^{0}C	54 to 86 %	-	-
3.	Thrips	31 to 32 ^{0}C	21 to 23 ^{0}C	-	88 %	56 %	-
4.	White flies	31 to 33 ^{0}C	20 to 24 ^{0}C	-	87 %	55 %	-
5.	Semiloopers	30 to 33 ^{0}C	20 to 23 ^{0}C	25 to 30 ^{0}C	85 to 90 %	-	4 to 8 hrs/day
6.	Tobacco caterpillar	30 to 33 ^{0}C	21 to 23 ^{0}C	25 to 30 ^{0}C	88 to 90 %	-	3 to 6 hrs/day
7.	Hairy caterpillar	30 to 33 ^{0}C	21 to 23 ^{0}C	25 to 30 ^{0}C	88 to 90 %	-	3 to 6 hrs/day
8.	Shoot and capsule borer	29 to 33 ^{0}C	15 to 21 ^{0}C	22 to 28 ^{0}C	80 to 90 %	-	7 to 9 hrs/day

Source: KVK, Mohol and Agromet, ZARS, Solapur.

to September. During the recent years there has been considerable change in the scenario of insect pests of castor in Maharashtra. This may be due to variations in the time of onset of monsoon, sowing time, cropping pattern and the cultivation of high yielding hybrids/varieties. Tobacco caterpillar and hairy caterpillar are the polyphagous pests feeding on several crops in the locality. These pests also infest the castor crop during vegetative phase and the shoot and capsule borer infest during re-productive phase and are becoming serious on castor. The shoot and capsule borer remained active during October to January with a peak activity during November. The change in sowing time (1st fortnight of July) in the scarcity zone of Maharashtra is likely to prove useful in reducing the insect pest incidence on castor.

The normal rainfall of the area for June to October months is 721 mm. However, total rainfall received during 2009-10, 2010-11, 2011-12, 2012-13 and 2013-14 was 623.00 mm, 705.40 mm, 686.40 mm, 501.30 mm and 627.40 mm, respectively which was deficit by 7 to 30 per cent as against normal. During all the five years under study, the high pest infestation was recorded in spite of good crop growth due to well distributed rainfall from June to October (i.e. near or slightly below normal).

The monthly weather parameters and insect pest population did not show significant correlation. Out of eight pests of castor, leafhoppers, thrips and white flies' population build up was favoured by hot, dry climate with clear sky. On the other hand, leaf miner, semilooper, tobacco caterpillar, hairy caterpillar and shoot and capsule borer population build up was favoured by wet, humid and cloudy weather conditions.

Hedge (2006) recorded the high infestation of castor semilooper during August and September at different AICRP centers (Palem, Hiriyur and Yethapur) in India. Outbreak of semilooper in some years was also reported by him where the pest caused over 50 per cent defoliation or even total crop failure in some locations. Makvana *et al.* (2004) reported that the incidence of leaf miner (*Liriomyza trifolii* B.) on castor commenced with the germination of crop on cotyledonary leaves. The population increased with the advancement of crop age and peaked in the first week of September; thereafter, the larval population decreased at low level and pest disappeared in the last week of October. Minimum temperature, relative humidity and rainfall showed positive correlation with the population of this pest. These reports are in conformity with the present findings. Maximum *Spodoptera litura* build-up (25.46 %) was recorded on cotton at temperature ranges from 26.00 to 35.10 ^{0}C, relative humidity from 89 and 62 per cent and total sunshine hours of 64.6 hrs/week (Selvaraj *et al.,* 2010). More or less similar behavior was observed for *Spodoptera litura* on castor crop.

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