Degree Days: A Tool for Insect Pest Management

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SUMMARY

Climate of the earth is changing at accelerating rate result into worst hit of climate changes on insect pest population. As a result of these, changes in growth and development pattern of the insect pests. Accurate prediction of insect pest activity is key factor for any insect pest management programme. Timely management of insect pest is necessary to avoid crop losses due to the particular insect pest. Calendar based prediction and management schedule for insect pest in the field is frequently inaccurate due the tremendous changes in weather year to year. Hence Degree day is a tool predicting the insect pest emergence and their related activity which help to carry the time pest management.

INTRODUCTION

The over the period of time climate of earth is changing faster than normal rate as a result of these, changes in climatic variable especially in temperature. In indian climate, It is expected that temperature increases annually by 1.18℃ , 2.87℃ and 5.09℃ in 2020, 2050 and 2080 respectively (Lal, 2003). Being cold blooded nature of insect, climate changes effect is worst because, temperature play major role in growth and development of insect. Result in differ response of insect pests in growth and developmental factor like rapid growth, early emergence, the less time require to complete life cycle, more no. of generation in the seasons, shifting of insect pests , reduces effectiveness of pesticide and faster degradation of pesticide etc. Due to these changes occurs frequently result into inaccurate prediction of pests activity when calendar date considered. Hence future prediction activity of insect is become quite challenging. Key for any successful integrated insect pest management is prediction of their growth dynamics which is help in timely, accurate use of management tactic. Hence Degree day is considered as important prediction tool for insect pest management. Insect development earlier in warm season than cool season. Insect growth is restricted to certain lower and upper temperature scale known as base temperature i.e. lower temperature threshold (LTT) and Upper temperature threshold (UTT) respectively. The optimum growth of insect is occurs between this two temperature threshold. Example for pink bollworm, LTT is 12.6℃ and UTT is 30℃ (Hamed, 2005). Insects require a certain amount of heat energy to complete life cycle from one stages to another stages hence by accumulating heat development occurs. Thus Degree Day (also known as thermal constant) is define as amount of heat energy accumulated over specified base temperature during 24 hours day. It is unit of heat accumulation. These base temperatures and Degree days are used to accurate future prediction of insect growth stages and their activities.

How to calculate Degree Day:

1. Phenological event such as first moth trap , first egg laying observed, first bloom etc. are known as biofix and are considered as starting point of Degree Days accumulation and calculation (January 1 in most cases).
2. Record the daily maximum and minimum temperature for locale (or it is obtain from nearest weather station).Simply add the daily maximum and minimum temperature and divided the sum of two get average temperature of the day. Then sub- tract the base temperature (generally considered average value 50 °F for those insect, value is unknown).No development occur when maximum temperature not rises above base temperature and zero degree days accumulate on that day.

$$\text{Degree Day (DD)} = [(T_{max} + T_{min}) / 2] - T_{base}$$

Where, T_{max} = Maximum Temperature

T_{min} = Minimum Temperature

T_{base} =   Base Temperature

3. Total Number of Degree Days (Cumulative Degree Days) accumulation was calculated by adding daily degree days from starting point of accumulation upto end of life event of particular insect. As a result, number of degree days required for particular event of the insect can be calculated.

4.These value help in predicting phonological event in future seasons and years.(Zalom *et al*. 1983)

Example: For yellow stem borer of rice required 136.3 degree days for egg hatching to go into the larval stage of insect. Hence after the 136.3 degree days accumulation, recommended spraying treatment can be effective to control the larval stages of Yellow stem borer. Same in Rice leaf folder required 98.1 DD to convert egg to larval stages. After 98.1degree days accumulation spraying schedule can be effective (Manikandan, 2013)

Application of Degree Days in Insect-Pests management:

- Degree day is simple to calculate and important component of integrated pest management. It help to accurate prediction of future insect activity such as egg laying, egg hatching, moth emergence etc. which help to avoid losses caused by insect pests.
- Degree day is not only show the status of insect pest activity but also give the information regarding status of beneficial organism in field, subsequent Population build-up, overwintering emergence. Degree days help to manage the operation like agronomic and pest management practices.
- Accurate prediction of pest activity make it possible due to degree day concept which tell when to spray and minimize losses and damage efficiently. Degree days useful in timely Scouting in field which help in management of insect pest activity.
- Degree day help to identify the vulnerable stages of insect hence timely, efficient and discriminate use of pesticide, avoid over spraying possible.
- It prevents resistance, resurgence of insect pest problem and help to minimize residue problem.

CONCLUSION

Various practices is carried out with different management approaches and methods to control the insect pests and damage to the related crop in field. Future Prediction and management of insect pest is on the basis of calendar date often result in poor insect control .On other hand comparison with using degree day to time treatment is more reliable than calendar date. Hence Degree day is considered as one of the effective component in IPM. It give the answer to question like when to spray, how to control and Hence, conclusion from above studied is that with the help of Degree days concept and integrated pests management practices help to timely tackle the damage caused by insect pests and avoid the crop losses.

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