



RESEARCH ARTICLE

THERMAL IMPACT ON THRIPSTABACI, LINDEMAN (THYSANOPTERA; THIRIPIDAE) AND THEIR ROLE IN THE ONION AGRO MARKET OF INDIA. A CASE STUDY CONDUCTED AT RAMGARH (JHARKHAND, INDIA)

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ABSTRACT

Climatic factors and especially the heat play the most significant role in the life cycle and their reproduction, life span and feeding habits of insects. Increase in climatic temperature increases the rate of growth and increase the population similarly in cooler condition slow down the development of species. The studied pest *Thrips tabaci* Lindeman (Thysanoptera, thripidae) is a serious onion pest of Ramgarh it causes both direct and indirect destruction to onion crops and resulting high losses in onion production. The climatic condition of Ramgarh is suitable for onion cultivation. The growing consciousness in people towards the onion consumption and always high marketing price promote the farmers to intensification of onion cultivation. This cash crop destroyed by *Thrips tabaci*. The adult pest and their nymphs lacerate the surface tissues of the foliage, puncture the leaves and suck the exuding sap ultimately the whole plant dries up and the size of the bulb reduced to small. Increase in climatic temperature directly influence the increase in *Thrips tabaci* population and development of new young leaves of onion plant also. The population growth of pest is due to the availability of vigorous green sap content and maximum hiding places suitable for continuous breeding. Moderate temperature and high humidity leads to grow new leaves which is full of nutrients for the pest. Migration of pest to surrounding crops and weeds occurs due to decline in availability of green sap it is due to the senescence of crop plant. *Thrips tabaci* Lindeman (Thysanoptera, thripidae) is a serious pest of onion at Ramgarh. Serious infestation decline 40% to 50% onion production. The pest not only decline the quality quantity and nutritional value of onion but also the marketing rate of onion. The control of pest population and infestation is very difficult so the farmers are advised to apply synthetic insecticides for rapid relief Carbaryl 0.1% or Monocrotophos 0.03% or Dimethonate 0.03% are effective. Some natural enemies as small birds, ants, mites etc. also control the pest population. *Seranus* sp. are also use it parasitized the nymph and control the pest population.

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INTRODUCTION

Ramgarh is a district town of Jharkhand state located at latitude 23.38°N and longitude 85.34°E. it is famous for important business centre with rich agromarket. Climate of Ramgarh is favourable for agriculture as well as for animal development, most of the farmers cultivate the vegetables as cash crops. Cultivation of onion has attained tremendous importance in Indian agriculture market owing to prepare tasty food items, healthy food supplements and to earn foreign currency by import. The growing consciousness towards the consumption of vegetables especially the onion is crazy for tasty and healthy diet have necessitate the orientation and intensification of onion farming. *Thrips tabaci* Lindeman (Thysanoptera, thripidae) is a serious onion pest of India. The study on *Thrips* infestation was studied at Ramgarh during the year 2018–2020. The experimental pest *Thrips tabaci*

Lindeman (Thysanoptera, thripidae) was one of the serious pest of *Allium cepa* (onion), it destruct the cultivated crops. The pest *Thrips* not only damage the cultivated crops of onion but it also damages the financial capacity of farmers of Ramgarh. It was observed that the experimental plant *Allium cepa* is an important agro product of Ramgarh and the farmers cultivate it on commercial level. The pest *Thrips tabaci* Lindeman damage this commercial crop significantly, sometimes it damages the standing crop up to 40% to 50%. The pest remain active throughout where and when the onion was cultivated. It was observed that temperature play an important role and control the lifecycle and population dynamics of *Thrips tabaci*, generally the higher temperature leads to faster development of nymph, pupa and reduce their incubation period at the same times lower or cool temperature slowdown the development of pest. Intense breeding occurs between the month of November and May at the temperature

ranged between 19⁰ C to 31⁰ C. Adult female laid total 30 to 60 eggs at the rate of 02 to 07 eggs per day singly and were inserted in the leaves of the host plant through the slit made by the ovipositor of the female. Nymph emerges out from egg within 01 to 07 days and they passes two instar. The 2nd instar of nymph were non feeding phase and it migrate to the soil where it pupate. Total pupation period were 01 to 04 days after it adult emerges out. A peculiarity were observed most of the emergence from eggs were female, hence most often female reproduces without mating, the eggs develops through parthenogenesis.

These adult *Thrips* and their nymphs lacerate the surface tissues of the foliage of the host plant they puncture the leaves and suck the exuding sap equally damage the host plant and are equally destructive. The puncture point of the host plant was exposed, causing bacterial and fungal attack. *Thrips* is the serious destructive pest of *Allium cepa* plants the farmers and local agro businessmen of Ramgarh get great loss by this pest this problem enforced the author to work on this onion pest and their control for the benefit of farmers.

Considerable works had been done by several workers on the life cycle of the pest *Thrips tabaci* Lindeman on onion plants but none of the researcher studied the life history of *Thrips tabaci* Lindeman on the cultivated crop *Allium cepa*, at Ramgarh. The present author deals with Thermal impact on *Thrips tabaci* Lindeman (Thysanoptera, thripidae), and their role on the onion agromarket of India. A case study conducted at Ramgarh (Jharkhand, India). Prevention from this pest was very difficult. Some natural enemies as small birds, ants, mites, spiders have been reported that they play an important role to control the population of pest. Author advised to farmers for rapid pest control apply Carbaryl 0.1%, Monocrotophos 0.03%, or Dimethoate 0.03% the synthetic chemical control. In biological control *Seranus* Sp. Parasitized the nymph of the pest and control the pest population.

MATERIALS AND METHODS

Standard methodology was applied for the study of Thermal impact on *Thrips tabaci* Lindeman (thysanoptera, thripidae), and their role on the onion agromarket of India: A case study conducted at Ramgarh (Jharkhand, India). The life history of the experimental pest and the nature of damaging the host plant were studied in the crop field as well as in the laboratory. The life history was studied during the year 2018–2020. Ten healthy selected plants of *Allium cepa*, were completely and carefully covered by a small mesh mosquito net separately. One pair (one male and one female) of experimental pest were introduced on the plant covered by mosquito net and observation was taken daily. One pair (one male and one female) of the experimental pest were kept in the cage of 20 cm X 20 cm X 30 cm. Space and fresh, soft leaves of host plant were provided for egg laying and hatching, this was food for newly hatched nymphs as well. In a separate cage some leaves of other plant were also provided to pest to observe their feeding interest and survival rate. *Thrips* activity were monitored by using sticky cards. Sticky cards were collected from crop field after a certain period and then examined under dissecting microscope. The data were recorded for further study. Methods of prevention of crop and control of pests by chemical and biological methods were applied, observed and recorded.

OBSERVATION

The pest Thrips tabaci Lindeman is a serious pest of Allium cepa it destruct the cultivated crop about 40% to 50% and some time it decline the production 40% to 80%. The temperature and rate of development from egg to adults were linearly related between 19⁰C and 31⁰C. The experimental host plant *Allium cepa* is a cash crop its infestation and losses in production directly decline the agro business status of farmers, caused by the experimental pest *Thrips tabaci* Lindeman (thysanoptera, thripidae). Oviposition typically laid by female inserted eggs in the leaves of host plant through the slit made by ovipositor. Eggs were commonly laid in singly and close to gather in linear cluster consisting of 02 to 07 eggs daily up to 02 to 03 weeks. Each female can lay 30 to 60 eggs. The eggs hatched in 03 to 10 days, tiny nymphs were appeared. Adults and nymphs were very much similar and equally destructive.

Nature of damage: The adult *Thrips* and their nymphs attack the host plant they puncture the leaves lacerate the surface tissues of the leaves and suck the exuding sap. Initially the leaves appear whitish spots later it turn tiny pale spot and the tip of the leaf get distorted and falls. Then the lower part of the leaves become bleached and ultimately the whole plant dries up. If the plant survive then the bulbs of the plant become very small in size and the production sometimes become 10%. The climatic condition of Ramgarh is suitable for onion crop hence the farmers cultivate this crop at large scale to improve their financial status. The experimental crop *Allium cepa*, is an important cash crop, common farmers of Ramgarh cultivate it as their capacity with vested interest. Infestation of crop by the experimental pest cease the financial state of the farmers and agrobusiness of Ramgarh.

Morphology of the adult pest: The experimental pest was a minute insect. The adult measures 01mm in length and yellowish brown in colour with slender thorax and large abdomen. Females were larger with developed wings, the wings were narrow bearing a fringe of hairs, legs were strong. Each leg were terminating in two jointed tarsus and a peculiar bladder. Legs were adopted for running. Males of the pest were reduced wings or wing were totally absent.

Morphology of the eggs: The eggs were white in colour and bean shaped oviposition typically laid inside the leaves of the host plants. Eggs commonly laid singly and close together in linear cluster consisting of approximately 02 to 07 eggs daily up to 30 to 60 eggs were laid in the life by a single female. In winter season one female laid 04 to 06 eggs per day. In summer season one female laid 06 to 07 eggs. In rainy season one female laid 02 to 04 eggs. Tiny nymphs emerges out after 03 to 10 days of incubation.

Morphology of the nymph: Nymphs hatched out from eggs after the incubation of 03 to 10 days. Nymphs were tiny but very much similar to the adult without wings. There were two nymphal stages were observed N1 and N2. N1 was feeding stage, they started feeding immediately after emergence. This period last in 01 to 03 days. Then N2 period started this period was non feeding stage during this period it descend to the soil it last up to 02 to 07 days then it transformed to pupa.

Pupal stage: pre pupal and pupal stages were developed in the soil up to the depth of 02c.m. to 05 c.m. Pre pupal stage last

Tabular representation of life-cycle of pest *Thrips tabaci* Lindeman On host plant *Allium cepa*

Name of the month	No. of eggs laid/day	Total no. of eggs laid	Incubation period to hatch nymphs in days	Nymph mature to Prepupa and pupa in days N1 N2	Prepupal stage in days	Pupal stage in days	Life-cycle completed in day	Average Temperature
November to February. (Winter)	04-06	40-50	05-07	02 -04	02	03	15- 20	11 C to28 C
March to June. (Summer)	06-07	50-60	03-04	01 02	01	02	11 -14	25 C to 37 C
July to October. (Rainy)	02-04	30-40	09-10	03 07	02	04	21-30	19 C to32 C

up to 01 to 02 days and pupal stage last up to 02 to 04 days , after which adult emerges.

Life history: *Thrips tabaci* Lindeman is a major pest of *Allium cepa* at Ramgarh, it is active throughout the year. Generally its breeding was observed between the month of November to the month of June. The emergence of male pest was very less ,its role in reproduction was insignificant and the eggs of the pest normally developed parthenogenetically. The life span of adult was about 11days to 30 days, female laid 30 to 60 eggs in their life period at the rate of 02 to 07 eggs per days .Female laid the egg to puncture the leaf of the host plant and inserted through the ovipositor singly .The eggs were white and bean shaped. Incubation period of egg hatching were 03 to 10 days. In winter season incubation period was 05 to 07 days. In summer season incubation period was 03 to 04 days. In rainy season the incubation period was 09 to 10 days. Tiny nymphs emerges out from eggs, nymphs were very much similar to adult but without wings. Immediately after hatching nymphs started feeding. Adult and nymph were equal harmful for host plants. They puncture the leaf of the host plant and suck the exuding sap. In the initial phase of attack the leaves blotches to white spots later it turn to small yellow to orange streaks in the middle of the leaf later it develops into elongated spindle shaped spots surrounded by pinkish margins due to drainage of leaf sap . The tip of the leaf getdistorted and falls and the whole plant dries up, if the plant survive then the bulb of the host plant be very small which was not marketable. The life history of the pest was completed in 11 to 30 days. In winter months as (Nov.,Dec.,Jan.,Feb.,) it was 15to 20 days. In Summer months as (Mar.,Apr.,May,June) it was 11 to 14 days. In Rainy months as (July, Aug., Sept., Oct.,) it was 21 to 30 days(table).Rainfall decreases the *Thrips* population due to wash off the pest.

SUGGESTIONS FOR PEST CONTROL

Prevention: Prevention from this pest was very difficult, to prevent from *Thrips tabaci* regular monitoring was necessary.

- Intercropping onion with garlic may be help to reduce *Thrips tabaci* population .
- Plant spacing _ ensure adequate spacing between plant to reduce *Thrips tabaci*population.
- The infested plants should be collected and destroyed.
- Nymphs of this pest was parasitized by *ceranisus* sp.
- Ants ,mites ,spiders and small birds are the natural enemeis of*Thrips* population .
- Farmers were advised for rapid relief synthetic chemical pesticides should applied. Pest population can be controlled by spray of Carbaryl 0.01% or Monocrotophos 0.03% or Dimethoate0.03%.

DISCUSSION

The pest *Thrips tabaci* Lindeman (thysanoptera, thripidae) is a serious key pest of plant *Allium cepa* .The growth of population of pest was directly related with the growth of onion plant, It gradually increase with vegetative stage of the crop and abrupt decline in population with maturity of crop. Adult pest and their nymphs were equal destructive they lacerate the surface tissues of the foliage of the experimental plant. They puncture the leaves and suck the exuding sap. Primarily the leaves show spotted appearance later it become white and then yellowish. Feeding injuries crate entry points for bacteria and foliar pathogens further damaging the plant.The tips of the leaves get distorted and fall. Damage to leaves reduce the plants ability to produce food leading and smaller bulb size. The infection by *Thrips tabaci* accelerate theplant maturity and senescence shortening the bulb growth period. The deformate and small size of the bulb of *Allium cepa* decline its marketability and financial status of the farmers of Ramgarh (Upadhyay 2017, 2019,2022,Upadhyay and Bakshi 2019). The Pest *Thrips tabaci*Lindman remain active throughout the year but intense breeding occurs between the month of November and in the month of May . In these month temperature and humidity of the climate were moderate. It was observed that the temperature and rate of development from egg to adults of pest were linearly related. The viability of adult *Thrips* decreased with the increased in temperature. Temperature and moisture plays an important role in the breeding of insect (Mala and Kumar2019, Upadhyay and Verma 2004, 2005).In the life cycle of pest the sex ratio progeny revelled no presence of male, only female emerged out, the breeding takes place through parthenogenesis. The vegetable*Allium cepa* is a cash crop decline its production by the pest directly declinethe market not only the Ramgarh but Indian market also.

Control of the population of *Thrios tabaci*was a difficult phenomenon. Some natural enemies were observed during experiment as ants,mites, spiders and small birds plays an important role to check the pest population .Some chemical or synthetic insecticides kill the adult and nymphs of the pest and reduce the pest population (Kumar & Tiwari 2009 , Prabhakar &Roy 2009 ,Upadhyay 2024) . Farmers were advised to apply synthetic chemical pesticide for rapid relief. In the morning spray the Carbaryl 0.1% or Monocrotophos 0.03% or Dimethoate 0.03% was very effective to control the *Thrips*infestation.

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