



MOST ABUNDANT SPECIES OF GRASSHOPPER i.e. *ACRIDA EXALTATA* (ORTHOPTERA: ACRIDIDAE) ON GREEN ROOF OF INDIA

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ABSTRACT

Acrida is genus of grasshopper in the family Acrididae. The genus contains around 40 species, which are found in Africa, Europe, Asia, North America, Hawaii, and Australia. Insects of this genus are omnivorous, and are a well-known pest of many agriculture crops. Grasshoppers are brown to greyish-green jumping insects that are moderately long and have prominent heads and large compound eyes. The front pair of wings are narrow, leathery, and thickened. The hind pair are thin, broadly triangular, transparent, or sometimes brightly coloured. A pair of hard, horny, heavy, large, with jagged inner edges and dark coloured triangular structures found one either side. The two mandibles move in horizontal motion and crush food between them.

Keywords: Grasshopper, Acrididae, Pest, India.

INTRODUCTION

The grasshopper is a flying animal belonging to order Orthoptera and Class Insecta. About 11,000 species exist. They are herbivorous and commonly seen in autumn; a few appear in summer and spring. During mating the male grasshopper deposits sperms into the female's vagina, which finds its way to the eggs through canals known as micropyles. An adult grasshopper goes through the stages egg, nymph and adult, and has a lifespan of approximately one year.

This is the initial stage of a grasshopper's life cycle. The mother grasshopper lays fertilised eggs in midsummer, and they remain 1 or 2 inches under the sand or in leaf litter. She sprinkles them with a sticky semisolid substance that sets to form an egg pod. Each egg pod contains 50 to 150 eggs, depending on the species. Normally female grasshopper can lay up to 25 pods. The eggs remain underneath for

about 10 months in autumn and winter before hatching into nymphs during springs or in the initial days of summer. This is the second stage of the grasshopper's life and the initial stage during which a young grasshopper sees the outside world. Nymphs look like adult grasshopper, called molts, apart from the fact that they are wingless and lack reproductive organs. They undergo five sub stages known as instar before fully developing into adult grasshoppers; each instar is characterised by shedding of the cuticle skin and gradual growth of wings. In order to survive, nymphs start to feed on succulent and soft plant foliage barely one day after hatching from the egg. This stage lasts for about five to six weeks before the young nymphs mature to adult grasshoppers.

Molting takes place during the nymph stage. The locust sheds its exoskeleton before maturing into an adult. While the exoskeleton covers the nymph's body, providing it with protection against external injuries, it inhibits its growth

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because of its rigidity and inability to give room for expansion. The nymph has to shed it in order to achieve growth. It undergoes five to six molts in which it changes its structure and form before reaching adulthood. This is a fully grown grasshopper. It takes about one month before the wings are fully developed. The mature grasshopper is more mobile than the nymph, a characteristic that helps them to hunt and flee from predators. The reproductive organs are fully grown, so the female can lay eggs until they are 1 or 2 weeks old, to allow them to gain enough weight before they start laying eggs. Once she starts laying eggs, the female continues to lay eggs at interval of three to four days until she dies. Adult grasshoppers live for about two months, depending on the weather.

The climate of India comprises a wide range of weather conditions across a vast geographic scale and varied topography, making generalisation difficult. Based on the Koppen system, India hosts six major climatic subtypes, ranging from arid desert in the west, alpine tundra and glaciers in the north, and humid tropical regions supporting rainforests in the southwest and the island territories. Many regions have starkly different microclimates. India is home to an extraordinary variety of climatic regions, ranging from tropical in the south to temperate and alpine in the Himalayan north, where elevated regions receive sustained winter snowfall. The nation has four seasons: winter (January and February), summer (March to May), a monsoon (rainy) season (June – September), and post- monsoon period (October- December).

In most of India summer is very hot. It begins in April and continues till the beginning of October, when the monsoon rains start to fall. The heat peaks in June with temperatures in the northern plains and the west reach 45° C and more. The monsoons hit the country during this period too, beginning 1st of June when they are supposed to find the Kerala coast, moving further inland from day to day. Moisture laden trade winds sweep the country bringing heavy rains and thunderstorms; sometimes these monsoon rains can be very heavy, causing flooding and damage, especially along the big Rivers of India, Brahmaputra and Ganges. The plains in the north and even the barren countryside of Rajasthan have a cold wave every year in December- January. Minimum temperatures could dip below 5°C but maximum temperatures usually do not fall lower than 12°C. In the Northern high altitude

areas of the northern mountains it snows through the winter and even summer months are only mildly warm.

MATERIALS AND METHODS

Grasshoppers were collected by the ordinary aerial insect net and through hand picking as well. It is preserved by killing, pinning, and drying. Grasshopper can be killed by freezing or with chemicals. The easiest and safe technique is to place insects into a freezer for several hours. They can also be killed by exposing them to a small amount of toxic fumigant such as ethyl acetate. Toxicants are usually used in conjunction with a specially prepared killing jar. The killing jar has a layer of plaster of paris poured in the bottom of the jar. Once ethyl acetate is poured onto dried plaster of Paris, the chemical is absorbed by the plaster, and the jar will produce toxic fumes for several days.

Usually it is not desirable to kill nymph because they lack characters needed for identification. Also, due to their soft body they do not preserve well in a dry state. They are best placed in alcohol to prevent excessive distortion. To mount adult grasshoppers on a pin, insert a pin into the dorsal surface, with the point protruding from the ventral surface. The preferred location for pinning is usually the posterior area of prothorax, and to the right of the midline. The grasshopper is pushed up on the pin so that not only the end, but a small amount of the shaft is protruding. This gives ample room to pick up the dead grasshopper without touching the insect body. Below the grasshopper body, collection data are provided via a label. This is accomplished by writing or printing data on stiff paper, and cutting the label to a small rectangle. A pinning block often is used to align the insect body and label(s) to standard heights. Data that should be included on the label include the date of collection, place of collection, and collector's name. Ecology data such as habitat or host plant may also be included. Pins vary in size and quality. It is highly desirable to use rustproof insect pins. Insect pins are longer and sharper than standard pins, allowing attachment of labels and easy mounting. To fully appreciate the beauty and to assist in identification, spread at least one forewing and hind wing. The usual procedure is to spread the left forewing perpendicular to the grasshopper body. Similarly, the leading edge of the hind wing is spread perpendicular; this results in full extension of the remainder of the hind wing, though if it is done the spread wing may aid identification.

To properly spread the grasshopper wings, some support is needed to keep the wings elevated and flat. A spreading board is usually used to provide wing support. A spreading board consisting of Styrofoam or another suitable pinning surface should have a strip of similar material glued on part of the board, so that one surface is higher than the other. Thus, the lower pinning board is used to support the grasshopper body on its pin, and the elevated portion is used to support the wing. Strips of the paper and pins are used to hold the wing in place. Whether or not the grasshopper wings are spread, grasshoppers must be dried to aid preservation. Drying can be accomplished by placing the pinned insect, often with its wings spread, in an oven at low temperature until the subject is dry and stiff. Once dried, the wings, antennae, and legs cannot be moved without breaking, so it is important to get the body parts aligned before drying.

It requires nothing more than a tight box with pinning material in the bottom. However, it is imperative that the box be tight, or carpet beetles and cockroaches will gain access and devour the pinned insects. To help prevent damage to specimens, place the moth balls or moth crystals in the box with the specimens. This will kill any insects that gain access, particularly ants, cockroaches, and book lice.

RESULTS

Acrida exaltata are general feeders on grasses and weeds and often move to cultivated crops. Their populations vary from year to year. Crops damage is likely to be greatest in years when dry weather accompanies high populations. Drought conditions reduce natural vegetation, forcing grasshoppers to move to cultivated crops. The two mandibles move in horizontal motion and crush food between them.

Family Acrididae shows maximum diversity, comprising 8,000 species, of these 136 species and 28 genera are endemic (Chandra and Gupta, 2013). Members of the family Acrididae cause considerable damage to agricultural crops, pastures and forests and are well reputed for their destructiveness all over the world (Joshi *et al.*, 1999). The primary diet for grasshoppers are grasses and forbs (Behmer & Joern, 1994). It is primarily graminivorous, feeding on several common grasses and sedges (Mulkern, 1967).

Acrida exaltata were recorded from Kashmir throughout the extreme winter in the month of

December, January and February (Azim and Reshi, 2008) while reported throughout the year except in December (Khan and Aziz, 1973). Population of the species start declining from July onwards and resurgence occurred in March-April in West Bengal (Shushanta and Halder, 1998). Akhtar *et al.*, (2012) recorded the species from rice ecosystem of Uttar Pradesh; Chitra, *et al.*, (2000) from rice field of Coimbatore, Usmani *et al.*, (2012) from pulses and paddy fields in Bihar and Jharkhand, Kandibane *et al.*, (2004) described from irrigated fields of rice ecosystem of Tamil Nadu. Kumar and Usmani (2014) also reported the species from the desert of Rajasthan.

TAXONOMIC ACCOUNT

Acrida Exaltata (Walker, 1859)

Truxalis exaltata Walker, 1859. *Ann. Nat. Hist.* (3): 222

Tryxalis brevicolis Bolivar, 1893. *Feuille Jeunes nat.* 23: 162. Syn. By Drish and Uvarov, 1953. *Tijdschr. v. Entomologie.* 96: 232.

Acrida lugubris Burr, 1902. *Trans. Entomol. Soc. Lond.* 157. Syn. By Drish and Uvarov, 1953. *Tijdschr. v. Entomologie.* 96: 232.

Acrida Exaltata (Walker); Kirby, 1910. *A Synonymic catalogue of Orthoptera (Orthoptera Saltatoria, Locustidae vel Acridiidae).* 3(2): 94.

Acrida curta Uvarov, 1936. *Zool. J. Linn. Soc.* 39: 536. Syn. By Drish and Uvarov, 1953. *Tijdschr. v. Entomologie.* 96: 232.

Acrida lugubris astigmata Prasad, 1956. *Proc. Nation. Acad. Sci. India.* B-26 (1): 22. Syn. By Drish, 1961. *Eos.* 37: 398.

Acrida Exaltata (Walker); Nayeem and Usmani, 2012. *Munis Entomology & Zoology.* 71: 404.

Diagnostic characters: head conically ascending, fastigium of vertex wide, protruding, considerably concave with parabolic apex and apparent carinula of vertex; pronotum with lateral carinae prominent, not lined internally with black, prozona shorter than metazona; pronotum and head of about equal length, transverse sulcus of pronotum placed near middle of disc; tegmina fully developed with pointed apex, a little produced beyond the hind knees; wings yellowish, hyaline, slightly shorter than tegmina; hind tibiae straight with two rows of spines.

Distribution India: Andaman & Nicobar Island, Andhra Pradesh, Assam, Bihar, Chhattisgarh, Delhi Goa, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir. Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Orissa, Punjab. Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, and West Bengal.

Elsewhere: Afghanistan, Bangladesh, Iran, Pakistan, Saudi Arabia, South Arabia, South East Tibet, Sri Lanka, Yemen and West Aden.

DISCUSSION

Population of the grasshoppers are greatly influenced by the climate and availability of the host plant and damage caused is directly proportional to their population. Pest status of *Acrida exaltata* has been reviewed in detail by numerous workers from different state of the nation whereas its population has been recorded from each and every state of the India. Damage to cereal crop is generally concentrated near field margin and is caused when hatching grasshoppers move out of egg beds into filed edges. Damage to cereal includes leaf notching and stripping but is most costly when stems are severed just below the head of maturing or mature crops.

Emphasizing the overriding priority of maintaining high economic growth rates and biodiversity assessment, investigation of species is of prime importance to raise living atandards and sustainable development.

REFERENCES

Susanta, N. and Halder, P., 1998. Population dynamics of the grasshopper *Acrida exaltata* (Walker) in the arid zone of West Bengal. *Ind. J. of Inter*, 2(1-2), pp.51-53.

Azim, M.N. and Reshi, S.A., 2008. Observations on the seasonal variations in population of three species of grasshoppers (Orthoptera: Acrididae) of Kashmir Himalaya. *Punjab Univ. J. Zool*, 23(1-2), pp.19-25.

Kumar, H. and Usmani, M.K., 2014. Taxonomic studies on Acrididae (Orthoptera: Acridoidea) from Rajasthan (India). *Journal of Entomology and Zoology Studies*, 2(3), pp.131-146.

Rafi, U. and Usmani, M.K., 2013. Diversity and distribution of acridid pests (Orthoptera: Acrididae) of Purvanchal region, Uttar Pradesh, India. *Journal of the Bombay Natural History Society (JBNHS)*, 110(1), pp.50-56.

Usmani, M.K., Khan, M.I. and Kumar, H., 2010. Studies on Acridoidea (Orthoptera) of Western Uttar Pradesh. *Biosystematica*, 4(1), pp.39-58.

Usmani, M.K. and Khan, M.I., 2010. A preliminary checklist of locusts and grasshoppers (Orthoptera: Acridoidea) of North East India. *Trends in Biosciences*, 3(1), pp.49-55.

Usmani, M.K., Akhtar, M.H., Kumar, H., Nayeem, M.R., Khan, M.I. and Rafi, U., 2013. Taxonomic Studies of Grasshoppers of Subfamily Acridinae (Acrididae: Acridoidea: Orthoptera) of Uttar Pradesh, India. In *Proceedings of the National Conference on Insect Diversity and Systematics: Special Emphasis on Molecular Approaches* (pp. 62-68).

Usmani, M.K., Akhtar, M.H. and Nayeem, M.R., 2012. Diversity and taxonomic studies of Acridoid pests (Acridoidea: Orthoptera) of pulses from Uttar Pradesh, India. *Munis Entomology & Zoology*, 7(2), pp.837-846.