

Original Research Article

Emerging Pests of Makhana (*Euryale ferox* Salisb.) Crop in Koshi Region of Bihar

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ABSTRACT

Makhana (*Euryale ferox* Salisb.), also known as Gorgon nut/Fox nut, Prickly water lily is an important aquatic fruit crop in Koshi region of Bihar. Survey and surveillance was conducted over the years to record the emerging pest status in Makhana crop. A total of six insect species and different unidentified species of gastropods were recorded as pests of Makhana crop. Almost all parts of Makhana plants i.e. leaf, leaf rib, petiole, shoot, fibrous root, flowers, fruits etc. were attacked. The insect pests viz., aphid, case worms, rib borer and gastropods under the changing cropping patterns and intensification of crop emerge as major constraints in getting maximum yield. Further, some of the pest like leaf bug and singhara beetle emerged as minor pest and in future intensification and changing cropping patterns may aggravate their population and infestation. Among the natural enemies, Coccinellids beetle viz., *Coccinella septumpunctata*; *Scymnus spp*; *Menochilus sexmaculatus*; *Brumus spp*. etc. were found to be associated with aphid.

Keywords

Makhana, Insect
pests, Gastropods,
Natural enemies

Introduction

Makhana (*Euryale ferox* Salisb.) also known as Gorgon nut/Fox nut, Prickly water lily is an important aquatic fruit. In general, its distribution is extremely limited to tropical and subtropical regions of South-East and East Asia and is known to exist in China, Japan, Korea, Russia, North America, Nepal, Bangladesh, Marala Headworks wetlands, North West side of Punjab, commonly growing along the water inlets on the left bank of River Chenab, facing Village Gondal, District Gujrat, Pakistan (Muhammad *et al.*, 2010) and some parts of India. In India, it is distributed in Bihar, West Bengal, Assam, Manipur, Tripura, Eastern Odisha, Madhya Pradesh, Rajasthan and Eastern Uttar Pradesh. However, its commercial cultivation is limited to North

Bihar, Manipur, parts of Assam, West Bengal and Madhya Pradesh. In the state of Bihar, major Makhana producing districts include Darbhanga, Sitamarhi, Madhubani, Saharsa, Supaul, Araria, Kishanganj, Purnea and Katihar of Mithila and Koshi region (Mishra, Jha, and Dehaidrai, 2003).

In India, it is cultivated in an area of 20,000 ha, out of which 80% area is in Bihar. The average production and productivity of Makhana crop in Bihar is 3.19 lakh q and 21.25 q/ha, respectively (Minten *et al.*, 2014). At present, 40-45 % of Makhana crop is cultivated in low land rice field condition and rest are traditionally grown in the pond system. Due to changing pattern of cropping system and intensification of crop, number

of abiotic and biotic factors acting upon, reducing the crop yield, of which insect pest and gastropods especially Mollusca's pose threats and emerges as potential major pests of the crop. Though there are meagre reports on the occurrence and status of pests, the four dozen insect and eight gastropod species were found associated with Makhana crop (Mishra *et.al.* 1992).

Hence, the survey and surveillance was taken up to investigate the status of insect pest and diseases in Makhana crop in and around Purnea and adjoining districts of Koshi region of Bihar since 2014 to understand the emerging pests in the region.

Materials and Methods

For survey and surveillance, Makhana plots were randomly selected at different locations in and around Purnea and adjoining districts of Koshi region of Bihar since 2014. Five plants were randomly selected from 0.4 ha plot and accordingly, 3 leaves (each from one plant) were examined for the collection of data on associated Insect and Gastropod at fortnightly interval from 10 spots during entire Makhana season.

The survey and surveillance of key pests was conducted continuously year after year since 2014 cropping season and different pests were found as emerging pests in Makhana crop in Koshi region of Bihar

Results and Discussion

During survey, the following emerging pests were observed on Makhana crop in Koshi region of Bihar. Six insect pests and different species of gastropod especially Mollusca's were found to damage Makhana crop (Table-1). It was observed that the pests were mainly damaging younger as well

as older root, leaf, leaf vein/rib, flowers, fruits and petiole of Makhana. Apart from direct injury, the damaged leaves/plant were predispose to the secondary growth of pathogens, fast decay, pre-mature damage and significant yield loss.

Though most of the pest were emerging/potential pests but due to the adoption and intensification of Makhana crop from pond to low land rice field, number of pests pose threats and emerges as major and minor pests.

Aphid (*R. nymphaeae* L.)

The peak activity of Aphid (*R. nymphaeae* L.) was from February to March and it sharply declined and disappeared in the month of April. Cloudy weather together with western winds enhances the aphid infestation.

Both nymph and adult suck the sap from upper surface of leaves. Under heavy infestation, the affected part of leaves turn yellow/rust red, fast decay and results in reduction in yield.

Case Worms ((*E. depunctalis* G. & *E. crisonalis* W.)

The case worms (*E. depunctalis* G. & *E. crisonalis* W.) appeared in February on the crop with peak activity from March to June and their population declined in July. The young larvae feed by scraping the leaf surface either in middle or at the margin. The larva makes an oval case out of the portion of the leaf cut out from it and remains inside it, moving with the case on the leaves. The larva of case worms were observed as one of the major pests of Makhana as it causes heavy damage and significant reduction in yield of Makhana crop.

Table.1 Insect and Gastropods associated with Makhana (*Euryale ferox* Salisb.) crop

S N	Common name	Scientific name	Family	Order	Damaging stage	Plant part	Pest status
1.	Aphid	<i>Rhopalosiphum nymphaeae</i>	Aphididae	Homoptera	Nymph & Adult	Leaves	++
2.	Singharabet tele	<i>Galerucella birmanica</i>	Chrysomelidae	Coleoptera	Grub & Adult	Leaves	+
3.	Root borer	<i>Donacia delesserti</i>	Chrysomelidae	Coleoptera	Grub & Adult	Flower, leaves & root	+
4.	Rib borer	<i>Chironomus spp</i>	Cheronomidae	Diptera	Larvae	Leaves & pod	++
5.	Leaf sucking bug	<i>Plea litruata</i>	Pleidae	Hemiptera	Nymph & Adult	Leaves	+
6.	Case worms	<i>Elophila depuntalis</i> <i>E. crisonalis</i>	Pyralidae	Lepidoptera	Larvae	Leaves	++
7.	Mollusca's	Unidentified*	-	-	Adults	Leaves & Petiole	++

*May be 3-5 species. ++ Major pest, + Minor pest, - Natural enemies

Table.2 Natural enemies of Aphid (*Rhopalosiphum nymphaeae*) in Makhana (*Euryale ferox* Salisb.)

S. No	Common name	Scientific name	Family	Order	Period of activities	Status
1	Lady bird beetle	<i>Coccinella septumpunctata</i>	Coccinellidae	Coleoptera	Jan. to Mid April.	+
2	Lady bird beetle	<i>Scymnus spp</i>	Coccinellidae	Coleoptera	Mid Jan. to April.	++
3	Lady bird beetle	<i>Menochilus sexmaculatus</i>	Coccinellidae	Coleoptera	Jan. to Mid April.	+
4	Lady bird beetle	<i>Brumus spp.</i>	Coccinellidae	Coleoptera	Feb. to March	+

Leaf Midge or Rib Borer (*Chironomous spp.*)

The Rib borer (*Chironomous spp.*) appeared in February and showed increasing trend up to July and their incidence was found till the harvest of the crop in the month of August. The incidence of chironomid larvae was observed minimum in February but it showed increasing trends from March onwards and continued till July. However, the population goes down from August onwards. The larvae of Chironomid were observed in developed ribs under the leaf surface. The larvae easily move inside the aerenchymatous cavities of ribs of the leaves

and causes rapid destruction. The colour of affected leaves changes to yellow, decay fast and affects the crop yields. Besides above three major insect pests, some of the insect pests were recorded as minor pest. These insect pests will gain momentum with the intensification of Makhana crop and will cause significant economic losses to the crop in future.

Sucking bug (*Plea litruata* F.)

The population of this pest appeared in the month of January in nursery and showed increasing trends from mid-February with maximum population in March and April.

The pest showed declining trends and disappeared in May. The population of bug is low and observed on leaves, tender shoots and roots of Makhana. Both the nymph and adult suck the cell sap from the under surface of the tender leaves, shoots and roots of the crop.

Singhara beetle (*Galerucella birmanica*)

The pest population appeared in last week of March and showed increasing trends in April with maximum population in May. The pest showed declining trends from May end and disappeared in June.

Grub and adult damages the younger and mature leaves, even some times petiole and integument of Makhana fruit. Grubs were more destructive than adults.

Gastropods

Gastropods especially different species of Mollusca's were found throughout the crop growth season with increasing trend from February to April with maximum in May-July and their incidence was found till the harvest of the crop in the month of August. This is one of the most notorious emerging pest of Makhana crop and outnumber the other pests. They lay eggs on fibrous root and leaves. The adults remain attached with under surface of the leaves, shoots and fibrous roots. It feeds on plant tissue of the host plant and caused fast decay of affected plants. This is a menace in Makhana crop as it is found in entire crop growth period and led to significant yield reduction.

Natural enemies of Aphid (*Rhopalosiphum nymphaeae*) in Makhana (*Euryale ferox* Salisb.)

A total of four coccinellids beetle was observed feeding on aphid (Table-2) in

Makhana crop. The maximum population of these coccinellids beetle was found in March. Among coccinellids beetle, *Scymnus sp* was observed more in number than *Coccinella septumpunctata*, *Menochilus sexmaculatus* and *Brumus sp*. The *Scymnus sp* was also found more effective predator of aphid compared to others.

It may be concluded from the survey and surveillance that the insect pests viz., aphid, case worms, rib borer and gastropods under the changing cropping patterns and intensification of crop emerges as major constraints in getting maximum yield. Further, some of the pest like leaf bug and singhara beetle emerged as minor pest and in future intensification and changing cropping patterns may aggravate their population and infestation. Paucity of information, as no detail work was reported on pest status in Makhana crop. However, occurrence and associated pest were reported by different worker (Banerjee, S.R., 1972; Mishra *et.al.*, 1989, 1990, 1991, 1992, 2003).

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