Brown Wheat Mite *Petrobia latens* (Muller) (Acari : Tetranychidae)

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Status Paper
by

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Foreword

Wheat is an important cereal crop, which contributes to nearly 25% of the total food grain production of our country. The crop is menaced by both insect and mite pests. *Petrobia latens*, a species of spider mite commonly known as brown wheat mite, is a serious pest of wheat in parts of Rajasthan, Punjab, Haryana, Delhi and Western Uttar Pradesh. Though this pest has been known since 1960's, efforts to study its bionomics and control were undertaken only in late 70's. The importance of this pest lies in its ability to infest number of cultivated crops like barley, rapeseed, mustard, coriander, cumin, oats, maize etc. and also to survive in the egg stage during the hot summer months when crops are not available.

The present book gives an account of status of this mite pest in the country and ways to combat it. Documented literature on biology, behaviour, ecology, sampling procedure and management has been compiled which would certainly open avenues for further systematic studies on this mite. I compliment the authors for bringing out this status paper on brown wheat mite under the aegis of All India Network Project on Agricultural Acarology and I urge the acarologists from Ludhiana and Varanasi centres to generate further data on this mite pest.

Dr. G. Kalloo
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MESSAGE

Though brown wheat mite is known as a pest of wheat crop since long time, the concerted efforts to keep its menace under check did not receive attention till the inception of All India Network Project on Agricultural Acarology (formerly All India Coordinated Research Project) in 1987. Further, an ICAR funded ad-hoc project strongly supported the studies on this pest especially in parts of Rajasthan.

I consider this book compiled by Dr. Ashok Sharma of Rajasthan Agricultural University and Dr N. Srinivasa of AINP (Agril. Acarology) is a good source of information for the scientific community in general and the acarologists in particular. I feel this compendium on wheat mite will benefit academicians, researchers, extension workers and students of SAUs and ICAR institutes.

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Brown Wheat Mite *Petrobia latens* (Muller) (Acari : Tetranychidae)

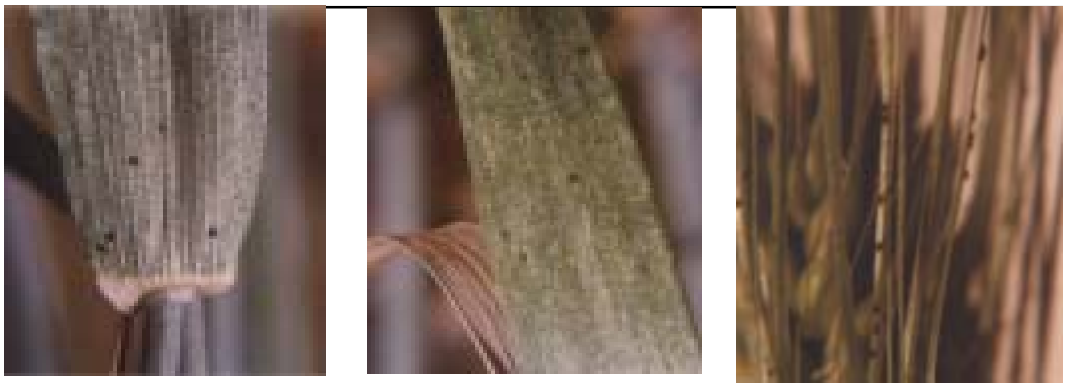
Introduction

Wheat (*Triticum aestivum* L.*)* and barley (*Hordeum vulgare* L.*)* are the two most important cereal crops of *rabi* season, of which wheat alone contributes to 25 per cent of the total food grain production of the country. Wheat and barley are infested by number of insect pests and mites. The brown wheat mite, *Petrobia latens* (Muller) is one of the most serious pests of these crops and confined to relatively dry regions of the country. It remains active during winter with peak activity in March. It is a minute, non-webbing and swift moving mite and has a tendency to dislodge from the plant when disturbed. The larvae, nymphs and adults feed on upper as well as the lower surface of leaves, leaf sheaths and spikes (*Fig.1*). Infested leaves start withering from top downwards. The plants become chlorotic due to loss of cell sap, resulting in poor grain formation. Heavily infested plants show sickly yellowish or bronzing appearance (Bindra and Kittur, 1961; Sharma and Bhatnagar, 1992; Bajiya and Sharma, 1995; Hussain and Sharma, 1996; Anonymous, 1997; Jat, 1997).

Geographical distribution and host plants

Brown wheat mite, *Petrobia latens* (Muller) was first described from Denmark. Now it has spread to ten different countries. The mite was recorded for the first time in India on wheat from Gwalior, Madhya Pradesh (Bindra and Kittur, 1961). Menon and Ghai (1968) reported this pest infesting wheat in Rajasthan, Delhi, Punjab and Haryana. In last few years its occurrence on wheat and barley crops, besides a few other crops and weeds has been reported from many parts of the country. Occurrence on wheat and barley has been further noted by Khan *et al*. (1969), Vyas *et al*. (1973), Rawat (1981), Sharma and Bhatnagar (1992), Bajiya and Sharma (1995), Hussain and Sharma (1996), Sharma and Bhardwaj (1998), on oats by Singh and Khan (1979), on maize by Sandhu *et al.* (1976), on coriander by Jain and Yadava (1986), on cumin by Gupta (1990), on onion by Menon and Ghai (1968), on pear by Gupta (1970), on rapeseed mustard by Sharma and Pareek (2000), on citrus and weed, *Convolulus arvensis* by Khan *et al.* (1969) and on weeds, *Heliotropium ellipticum, Melilotus indica, Panicum antidotale, Wedelia calandulacea, Eremopogon foveolatus, Phyllanthus fraternus, Brassica caber, Artiemisia seuparis, Phalaris minor, Corchorus sativus* by Anonymous (1997).

The detailed survey for mites infesting wheat and barley crops in different agroclimatic zones of Rajasthan during 1994ñ97 indicated that the overall intensity of *P. latens* was



a b c

Fig. 1. *Petrobia latens* feeding on wheat leaves (a and b) and spikes (c)

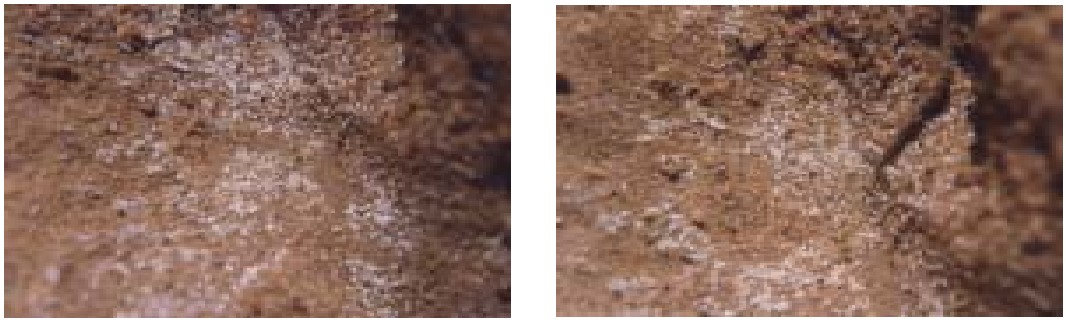


Fig. 2. Diapausing summer eggs of *Petrobia latens* laid in soil in wheat field

Fig. 3. *Coccinella septempunctata* adult on *Petrobia latens* infested wheat plant

high in wheat as compared to barley, it was high in Zones III A and III B and low in Zones II A, II B. No mite population was recorded in Zones I A, IV A, IV B and V (Anonymous, 1997).

Sampling

Vyas *et al.* (1973) assessed brown wheat mite population by removing the mite infested leaves and placing them in specimen tubes. The mite appears in later stages of the crop, hence tapping the entire plants would be necessary. A simple technique to assess the population of *P. latens* on wheat plants has been suggested by Khan *et al.* (1977) taking into account the behaviour of the mite. The foliage is tapped to dislodge the mites over glycerine smeared glass slides (measuring 2.5cm x 7.5cm) held in a sampler. The sampler consists of a rectangular scyrofoam (measuring 15cm x 25cm) of 1 cm thickness with four cavities to hold the slides. When the sampler is placed at the ground level near the infested plants and the plants are disturbed gently, mites falling on the slides get stuck to the glycerine aiding easy counting of their numbers.

Ecology

The mite, *P.latens* has been found damaging barley and wheat crops both in irrigated and unirrigated tracts of Rajasthan (Khan *et al.,* 1969; Sharma and Bhatnagar, 1992; Sharma and Nandan, 1995 ; Anonymous, 1997). A significant difference in the incidence of mite has been observed among different wheat and barley varieties (Phadke *et al.,* 1972; Doval *et al.* 1974 ; Vyas *et al.,* 1979 ; Deol *et al.*, 1980 ; Singh, 1986 ; Sharma and Nandan, 1994, 1996 ; Bajiya and Sharma, 1995 ; Hussain and Sharma, 1996). The maximum mite population was recorded on Cñ306 and Azad varieties of wheat and barley, respectively. The variety Sonalika of wheat and RD 227 of barley were found fairly tolerant to the mite (Anonymous, 1997).

Jain and Yadava (1986) observed incidence of the mite on coriander during first week of March which continued upto third week of March, while the infestation on cumin started in early February, reached peak in March (Gupta, 1990). Singh and Bhatia (1983) recorded reduction in the yield of barley varieties due to mite infestation, reduction was maximum in variety DLñ200 and the loss was negligible in variety RSñ6.

Mite population was under control in wheat following soil application of micronutrients particularly zinc and boron (Singh, 1986). Sharma and Sharma (1998) reported minimum population in wheat plots treated with zinc followed by boron and copper. The incidence in wheat was maximum in soils with low salinity compared to soils with high salinity.

The incidence was high on eastñwest side as compared to north-south side in wheat and barley crops (Singh and Bhatia, 1983 ; Anonymous, 1997). The maximum mite activity was observed during the mid day periods (Khan *et al.,* 1969 ; Sharma and Bhatnagar, 1992).

A significant positive correlation was observed between populations of *P. latens* and minimum temperature and relative humidity on wheat (Anonymous, 1997 ; Hussain and Sharma, 1998).

Biology

The mite completes its life cycle in eight stages *i.e.* four active and four quiescent stages. The winter eggs are deposited mainly on the dry leaves of wheat and barley crops. The mite lays two types of eggs ìnon-diapausing winter eggsî and ìdiapausing summer eggsî. The brick red non-diapausing eggs are laid singly or in batches. Diapausing summer eggs are white and are laid in clusters on soil clumps (*Fig. 2*). At one time, a female lays only one type of eggs. Generally no males are found, thus reproduction is parthenogenetic. A single female lays 8 to 13 winter or 2 to 5 summer eggs per day. During the entire life span, 29 to 110 winter or 11 to 43 summer eggs are laid. Freshly laid winter eggs are spindle shaped and soft, later become spherical and possess a hair like projection. Each egg measures 0.13 mm length and 0.12 mm width. The incubation period ranges from 8-13 days at ambient temperatures.

Diapausing eggs remain dormant throughout summer and rainy seasons and are coated with a white substance. The egg measures 0.1 mm in length. The soil moisture plays an important role in hatching of the eggs, provided the eggs are diapausing for a sufficient period (Anonymous, 1997).

The newly hatched larva with three pairs of six segmented leg is colourless and turns brown after feeding and measures 0.19 mm in length and 0.20 mm in width. The larval period lasts for 1-2 days followed by a quiescent stage. The active greenish to brown protonymph possesses four pairs of legs and measures 0.32 mm in length and 0.28 mm in width. The protonymphal period ranges from 0-3 days followed by a quiescent stage. The deutonymph is more or less similar to protonymph except in size. It measures 0.44 mm in length and 0.34 mm in width. The deutonymphal period varies from 1-4 days and is followed by a quiescent stage before it develops into an adult. The adults are very active and start feeding soon after emergence. The fully matured females are metallic brown in colour and measure 0.58 mm in length and 0.46 mm in width. The adult female lives for 20 days.

Management

Integration of various methods for the management of *P. latens* has not been attempted well. However, some of the cultural practices like date of sowing, crop varieties, fertilizer doses and the role of predatory fauna have been studied.

The effect of sowing time on mite incidence indicated that the population increased gradually at all the sowing dates and the crop yield decreased with delay in sowing (Sharma and Nandan. 1995)

Association of predatory mite, *Lasioseius terrestris* Summers and Schlinger with *P. latens* was reported by Menon and Ghai (1968). However, exact role of this predator in regulation of the mite population was not observed. Sharma *et al.* (1994) and Sharma (2001) observed *Amblyseius alstoniae* Gupta, as efficient predator in the control of *P. latens* population under field conditions in Jobner area of Rajasthan. It was found feeding on *P. latens* in wheat and barley crops in all the agro-climatic zones of Rajasthan except Zone IA and VB. The incidence of the predator starts from third week of January and continues upto second week of March with peak during last week of February. The predator population was directly proportional to the prey mite population. A single mite devoured

3.9 prey mites in three hours (Anonymous, 1997). The insect predator, *Coccinella septempunctata* L. (grubs and adults) has been observed preying on *P. latens* (*Fig. 3*). The incidence of the coccinellid beetle occurred during last week of February and later declined as the prey number decreased. A single beetle consumed 13.1 mites in three hours (Anonymous, 1997).

Bindra and Kittur (1961) found dusting with sulphur at a high dose of 30 to 40 lbs/ acre effective against the brown wheat mite infestastion. Saxena and Rawat (1969) tested various contact and systemic pesticides for the control of *P. latens* on wheat crop in Madhya Pradesh. They found that sprays of thiometon and dimethoate, each at 0.15%, and parathion 0.06% @ 900 l/ha and parathion dust 1.5% @ 24.7 kg/ha effectively controlled the mite. Bhatia *et al.* (1974) found formothion and phosphamidon to be more toxic than dicofol. Deol and Sandhu (1976) tested the effectiveness of seven chemicals against *P. latens* on wheat through field trials in Punjab. Dimethoate, monocrotophos and oxydemeton methyl applied @ 0.10, 0.15 and 0.10 kg ai/ha, respectively, controlled the mite effectively. Bajiya (1994) evaluated few pesticides and found phosphamidon (0.03%) as most effective followed by ethion (0.05%) and dimethoate (0.03%). Sharma and Manohar (1994) found ethion (0.05%) as most effective followed by dicofol (0.04%) and phosphamidon (0.05%). Methyl demeton (0.025%) and formothion (0.05%) were least effective. Hussain and Sharma (1995) found monocrotophos (0.04%) as most effective and phosphamidon and dimethoate (each at 0.03%) were next in the order of effectiveness. Anonymous (1997), Sharma and Bhardwaj, (1998) and Nogia, (2001) observed ethion (0.05%) as effective followed by phosphamidon (0.03%) and monocrotophos (0.05%).

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