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First report of red vegetable mite, *Tetranychus neocaledonicus* Andre (Acari: Tetranychidae) on apple (*Malus domestica* Borkh) from India

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Abstract
Survey was conducted during 2013 and 2014, infestation of red vegetable mite *Tetranychus neocaledonicus* Andre (Acari: Tetranychidae) was observed on apple (*Malus domestica* Borkh) foliage in Ropa velley of Kinnaur district of Himachal Pradesh, India. This mite was found feeding on lower surface of leaves and leaves appears to be yellowish brown. The pest was identified as *T. neocaledonicus* Andre. This was the first report of *T. neocaledonicus* infestation on apple from India.

Keywords: Mites, phytophagous, pest, acari, tetranychidae

1. Introduction
Apple (*Malus domestica* Borkh) is an important fruit crops especially in the state like Himachal Pradesh and Jammu & Kashmir. This crop is important for uplifting the economy of farmers of Himachal Pradesh. Apple is grown on large scale in Himachal Pradesh and contributes a lot to the state revenue. This crop is attacked by various pest species, among these pests, mites are one of the important pests [1]. Mites are among the destructive pests of agri-horticultural crops in many parts of the world. Mites of family Tetranychidae (Acari: Prostigmata) are known as spider mites include important pests of agri-horticulture crops. These phytophagous mites feed on different parts of plants, mainly found on the lower surface of leaves, their feeding initially show speckling and later turn yellowish or brownish appearance and finally leading to defoliation. With the increase in their population mites spread to all parts of the plants and produce webbing over the entire plants. Moderate population may greatly affect crop production and heavy infestation results in death of the plants [2].

In the present study *Tetranychus neocaledonicus* Andre was observed on apple which was new host for this species in the country. Common name of *T. neocaledonicus* Andre is red vegetable mite and its incidence was earlier reported on different vegetables, ornamentals and subtropical fruits from the country. Seasonal incidence of *T. neocaledonicus* and seasonal association of natural enemies were reported on okra [3]. Biology of *T. neocaledonicus* was reported on *Moringa oleifera* Lam. [4]. Outside India, *T. neocaledonicus* and *T. marianae* were reported as cosmopolitan species in tropical and subtropical areas of Australia infesting a wide variety of agricultural plants causes considerable damage [5]. The red vegetable mite was reported as serious pest of brinjal reported on different vegetable crops and its incidence was reported throughout the year on fig and mango trees [6]. *T. neocaledonicus* in association with *T. ludeni* and *Aceria mori* cause considerable damage (5-10%) to mulberry in India [7]. Infestation of *T. neocaledonicus*, its seasonal population was recorded on brinjal [8].

2. Material and Methods
In the present study a survey was conducted during 2013 and 2014 in different apple growing areas of Himachal Pradesh, India. Mite specimens were collected from apple orchards of Roppa valley in district Kinnaur. Geographically this valley lies between 77° 45' to 79° 00' 35" East and 31° 22' to 33° 012' 40" North, elevation of this valley varies from 3800-5000 m amsl. Climate of this valley is dry-temperate and suitable for production of good quality temperate fruits and vegetables. Samples were collected in well labelled poythene bags tied with rubber bands and transported to the laboratory. Samples were observed under stereo zoom microscope (Olympus SZX9) and stored in 70% ethyl alcohol, clearing was done in Lactic acid and

mounted in Hoyer's media on microscopic slides. Specimens were identified by using the reference key [9] on Olympus phase contrast microscope (SZX 41).

3. Results

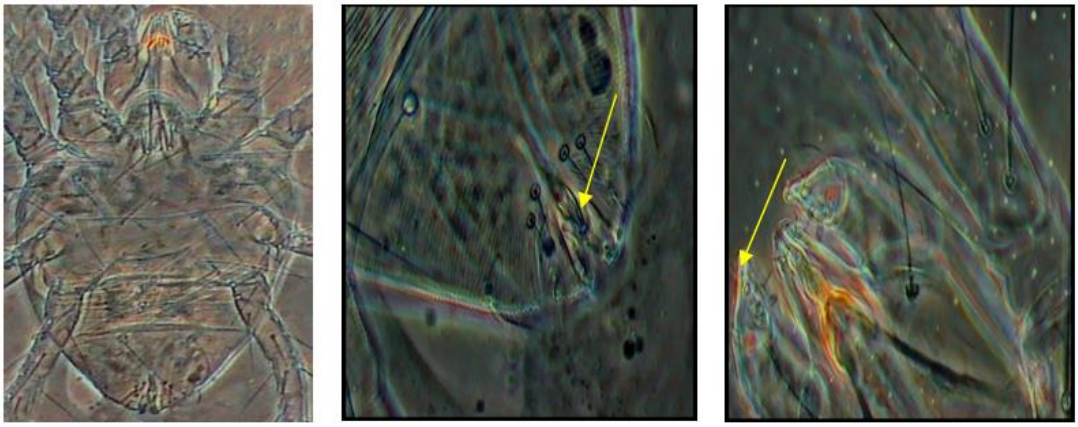
Infestation of *T. neocaledonicus* was observed on apple in the month of September and October during both the years. Morphologically this mite appears light red in colour. Heavy infestation was observed on apple in this area during the survey. Mite infestation was observed on lower surface of leaves, leaves shrieked by the infestation of this species and leaves appear to be light green due to loss of chlorophyll content. During this survey ♀ and ♂ specimens were processed for their identification. Slides of male specimens were identified properly as these were important for species identification. Identifying characters of *T. neocaledonicus* are discussed as:

3.1 Nature of damage

During the study it was recorded that the infestation of *T. neocaledonicus* causes browning of foliar portion due to loss of chlorophyll content and infested plants were easily recognized.

3.2 Taxonomical Characters

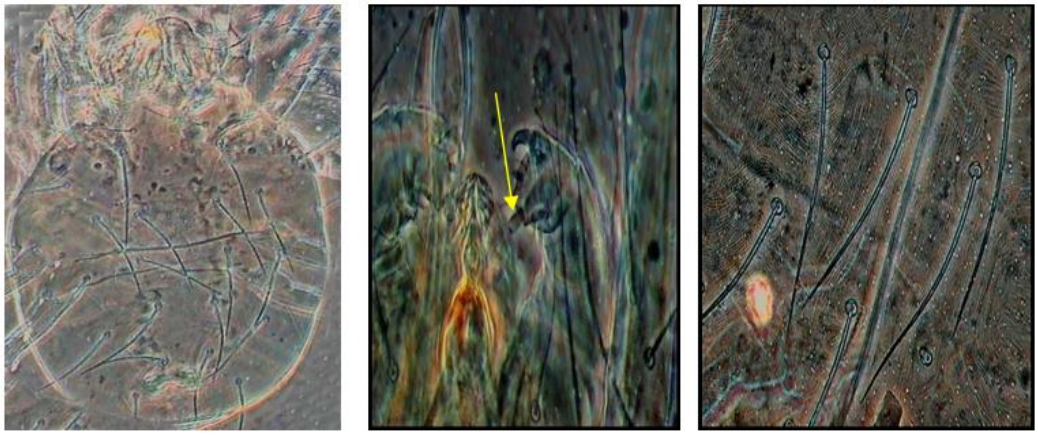
***Male*:** Body including rostrum 315.12 long, 196.58 wide. Palpus with terminal sensillum 4 times long as broad. Peritreme at distal end gradually bends downward to form hook. Dorsal idiosomal setae simple and tapering, longer than interval between their longitudinal bases. Tibia I with 3 sensory and 8 tactile setae, tarsus I with 2 sensory and 1 tactile setae proximal to duplex setae. Tibia II with 7 tactile setae, tarsus II with I sensory and 3 tactile setae proximal to duplex setae. Aedeagus with very distinct berry like aedeagal knob Figure 1.



(A) (B) (C)

Fig 1: Different body parts of male of *T. neocaledonicus*: (A) Dorsum. (B) Aedeagus. (C) Terminal sensillum of palpus.

Female: Body including rostrum 554 long, 263 wide. Terminal sensillum of palpus 3 times long as broad, dorsal sensillum slender. Peritreme at distal end gradually bends downward to form hook. Dorsal idiosomal setae one and half time longer than interval between their longitudinal bases. Tibia I having 1 sensory and 7 tactile setae, tarsus I with 2 sensory and 3 tactile setae proximal to duplex setae. Tibia II with 1sensory and 6 tactile setae, tarsus II with I sensory and 3 tactile setae proximal to duplex setae. Striation diamond shaped outer and inner sacrals of same length. Clunals small Figure 2.



(A) (B) (C)

Fig 2: Different body parts of female of *T. neocaledonicus*: (A) Dorsum. (B) Terminal sensillum of palpus. (C) Dorsal body setae and body striae.

4. Discussion

There was no report available regarding infestation of *T. neocaledonicus* on apple from the country. Earlier, infestation of *Tetranychus urticae* Koch, *T. ludeni* Zacher, *T. hypogeae* was reported on various crops from different regions of the Himachal Pradesh [10-14]. *T. neocaledonicus* was reported from

different states of India on a wide range of hosts and commonly known as red vegetable mite. This species was reported as major pest of subtropical fruits like, Fig, mango and ornamental plants [15]. Infestation of *T. neocaledonicus* was reported on various vegetables from Uttar Pradesh, India [16]. This species was reported from West Bengal, India to infest Jasminum in association with other phytophagous mites [17].

5. Conclusion

There was no record of this species on apple from this country as Himahal Pradesh and Jammu & Kashmir are the major apple producing state of India. During the present study this species was reported for the first time on apple from India.

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