

Two New Species of Genus *Neoseiulus* (Acarina: Phytoseiidae) from Punjab, Pakistan*

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Abstract.- Two new species from genus *Neoseiulus* viz. *Neoseiulus abelmoschus*, new species and *Neoseiulus hadiae*, new species have been illustrated and described from Punjab, Pakistan. *Neoseiulus abelmoschus* new species has two pairs visible pores, chelicerae movable digits without teeth while fixed digits with 4 teeth, ventrianal shield pentagonal and setae Z4 serrated. In *Neoseiulus hadiae* new species peritreme extending upto setae r3, chelicerae movable digits without teeth while fixed digits with 7 teeth and ventrianal shield smooth but lacking pores. However, a key to all the *Neoseiulus* species recorded so far from Punjab-Pakistan has been given in this manuscript.

Key words: Phytoseiids, Predatory mites.

INTRODUCTION

Mites of family phytoseiidae are excellent and universally admired predators of plant feeding mites, small soft bodied insects like scales, aphids, thrips, whitefly and their eggs (Nesbitt, 1951; Muma, 1955; Nomikou *et al.*, 2001, 2003, 2005; Naher and Haque, 2007). Out of many genera of phytoseiid mites, the mites of genus *Neoseiulus* are of greater significance in controlling different economically important pests. Berry *et al.* (1991) found that *Neoseiulus fallacis* (German) can be used as an effective biological control agent of *Oligonychus pratensis* (Banks) in corn. Pettitt (1992) reported *Polyphagotarsonemus latus* (Banks) was controlled by *Neoseiulus barkeri* Hughes. Morris *et al.* (1999) reported that *N. fallacis* has been used in a variety of biological control programs against phytophagous mites and different insect pests. *Neoseiulus californicus* (McGregor) (Acari: Phytoseiidae), is widely distributed predatory mite which is currently being recommended for the control of different crop pests because it is cheaper to purchase (McMurtry, 1977; McMurtry and Croft, 1997; Hoddle, 2000). It has also been used for the control of spider mites in field and greenhouse

horticultural crops (Jolly, 2000; Rhodes and Liburd, 2006).

Genus *Neoseiulus*, was erected by Hughes in 1948 and designated *Neoseiulus bakeri* Hughes as its type species. The taxonomic and systemic work of genus *Neoseiulus* all over the world conducted by Muma (1961), DeLeon (1965), Muma (1967), Muma and Denmark (1968), Muma and Denmark (1970), Ragusa and Henriot (1983), Daneshvar (1987), DeMoraes *et al.* (1997), Ehara (2002), Kreiter *et al.* (2006) is worth mentioning.

In Pakistan, Chaudhari *et al.* (1979), Chaudhari and Akbar (1985), Ahmad and Chaudhari (1988), Khan *et al.* (1990), Khan and Chaudhari (1991) and Bashir *et al.* (2006) have described 6, 2, 5, 2, 3 and 1 *Neoseiulus* species, respectively, out of which 12 belong to Punjab province. The present author added two new species, thus making a total of 14 from Punjab and 21 from Pakistan.

By virtue of the predatory habits, the phytoseiid mites of genus *Neoseiulus* have gained a great economic importance as bio-control agents that could successfully be used in IPM. Further, these mites can be used as an alternative to miticides (causing health hazards and pollution problems) on variety of crops (Liburd *et al.*, 2003; Rondon *et al.*, 2004) and thus safeguarding the environment.

MATERIALS AND METHODS

Collection of *Neoseiulus* mite specimens was

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made from different habitats like crops, vegetables, orchards, ornamentals, wild plants and leaf litter in different agro-ecological zones of Punjab by the following two methods:

(i) *Sieve collection method*

This method was used for the spot collection of mites. In this method, a sieve was held over a piece of white paper and different plant parts were shaken in the sieve. Mites falling on the white paper were collected and preserved in 70% alcohol having few drops of glycerin.

(ii) *Berlese's funnel method*

Samples of leaf litter, debris and soil were collected from different locations and brought to the laboratory to run through Berlese's funnel. The mites moving away from heat and light fell down the funnel in the beaker with 70% alcohol and few drops of glycerin.

The mites thus collected by above mentioned methods, were mounted on glass slides by using Hoyer's Medium prepared in the laboratory for this purpose. The slides were then studied under high power phase contrast microscope. Drawings of different body parts were made by using ocular grid and specimens were identified by using keys in the monographs and literature published. Setal nomenclature of Rowell *et al.* (1978) has been followed in this paper. All measurements are given in micrometers (μm). The holotypes of new species were preserved and deposited as slide mounted specimen to the collection of Acarology laboratory, University of Agriculture, Faisalabad, Pakistan.

KEY TO THE SPECIES OF GENUS *NEOSEIULUS* IN PUNJAB, PAKISTAN

- | | | | |
|-----|--|------|---|
| 1. | Dorsal shield smooth..... | 2 | ventrianal shield; membranous fold present between genital and ventrianal shield |
| 1'. | Dorsal shield with reticulations or striations | 7 | <i>N.tardus</i> Khan & Chaudhri |
| 2. | Seta Z5 serrated..... | 3 | |
| 2'. | Seta Z5 smooth..... | 4 | Dorsal shield concave near setae R1 |
| 3. | Peritreme reaching upto setae r3; chelicerae fixed digit with 3 teeth;genital shield wider than the width of ventrianal shield; membranous fold absent between genital and ventrianal shield | 5 | Dorsal shield oval near setae R1 |
| | <i>N. eremicus</i> Chaudhri, Akbar & Rasul | 6 | Peritreme reaching upto setae j3; ventrianal shield pentagonal in shape with one pair pore and reticulated |
| 3'. | Peritreme reaching upto setae j1; chelicerae fixed digit with 11 teeth;genital shield shorter in width than | 5' | <i>N.longispinosis</i> Evans (Chaudhri, Akbar & Rasool). |
| | | 6. | Peritreme reaching upto setae j1; ventrianal shield quadrate in shape and without pores and reticulations ... |
| | | 6' | <i>N.kamalensis</i> Bashir, Afzal & Ahmad. |
| | | 6. | Dorsal shield with 4 pairs visible pores; peritreme extending upto setae j1; chelicerae movable digit with one tooth; ventrianal shield striated and with one pair pore |
| | | 6' | <i>N.congenitus</i> Chaudhri & Akbar. |
| | | 6'. | Dorsal shield without pores; peritreme extending upto setae r3;chelicerae movable digit without any teeth; ventrianal shield smooth and lacking pores |
| | | 7. | <i>N. hadiae</i> n.sp. |
| | | 7. | Width of genital shield either equal or wider than the width of ventrianal shield..... |
| | | 7'. | Width of genital shield shorter than the width of ventrianal shield..... |
| | | 8. | Peritreme reaching upto the base of j1; chelicerae movable digit without teeth and fixed digit with 4 teeth |
| | | 8' | <i>N.abelmoschus</i> n.sp. |
| | | 8'. | Peritreme extending beyond j3 but not upto j1; chelicerae movable digit either with one or two teeth and fixed digit with 8 or 9 teeth |
| | | 9. | Chelicerae movable digit with one tooth; ventrianal shield rectangular in shape and wavy laterally..... |
| | | 9' | <i>N. bheraensis</i> Chaudhri, Akbar & Rasool |
| | | 9' | Chelicerae movable digit with 2 teeth; ventrianal shield quadrate in shape and convex laterally |
| | | 10. | <i>N. tabularis</i> Chaudhri, Akbar & Rasool. |
| | | 10. | Peritreme extending beyond setae j1 |
| | | 10'. | Peritreme either extending beyond j3 or extending upto j1 but not beyond j1 |
| | | 11. | Dorsal shield with 3 pairs visible pores |
| | | 11'. | Dorsal shield with 5 pairs visible pores |
| | | 12. | <i>N. orobos</i> Ahmad & Chaudhri. |
| | | 12. | Dorsal shield with 3 concave areas near setae z3, z4 and R1; setae Z5 smooth; chelicerae fixed digit with 8 teeth |
| | | 12'. | <i>N. turpis</i> Ahmad & Chaudhri. |
| | | 12'. | Dorsal shield with 2 concave areas near setae z4 and R1; setae Z5 serrated; chelicerae fixed digit with 4 teeth |
| | | 13. | <i>N. mergentis</i> Ahmad & Chaudhri |
| | | 13. | Dorsal shield without small platelets and with shorter setal length; peritreme extending well beyond setae j3; ventrianal shield entirely striated; leg IV with one macroseta on basitarsus |
| | | | <i>N. myrtea</i> Chaudhri, Akbar & Rasool |

- 13'. Dorsal shield with 2 pairs small platelets and with longer setal length; peritreme reaching upto setae j1; Ventrianal shield posteriorly striated; leg IV with 3 macrosetae one on each of genu, tibia and basitarsus.....
.....*N. consobrinus* Chaudhri & Akbar.

RESULTS AND DISCUSSION

Neoseiulus abelmoschus, new species

Female

Dorsum

Dorsal shield reticulated entirely; 320 long; 160 µm wide; 3 concave area on lateral margins of the shield (Fig. 1A); chelicera 24 long, 4 teeth on fixed digit and no teeth on movable digit (Fig.1C). Dorsal shield with 17 pairs setae and 2 pairs visible pores. All dorsal setae smooth except Z4 and Z5, serrate and setaceous (Fig. 1A). Dorsal and sub lateral setae measuring: j1 26, j3 30, j4 23, j5 25, j6 27, J2 40, J5 10; z2 18, z4 28; s4 35; Z1=S2=40; S4 50, S5 53; z5 20, Z4 57, Z5 53; r3 32, R1 25 (both on membrane outside the shield). Peritreme reaching the base of setae j1, peritremal shield base pointed as shown in Figure 1F.

Venter

Sternal shield smooth; 86 long; 100 wide; flat posteriorly, slightly convex anteriorly with 3 pairs setae and 2 pairs pores (Fig 1B). Genital shield smooth; 86 wide with 1 pair setae; wider than ventrianal shield width. Genital and ventrianal shield 12 apart with a double lined membranous fold in between. Ventrianal shield smooth; pentagonal shaped; 100 long; 66 wide with 3 pairs preanal setae, 1 pair para anal setae, one post anal setae and 1 pair small pore (Fig 1B). Four pair setae including JV5 smooth 28 long on the membrane surrounding the ventrianal shield. Two pairs metapodal platelets (Mp): primary platelets 30 long; secondary platelets 10 long (Fig. 1B).

Spermatheca

Shape is rounded and atrium knot like as shown in (Fig. 1E).

Legs

Macroseta on leg IV basitarsus 35 long (Fig.1D).

Male

None in the collection.

Etymology

The name of the species derived after the name of its source plant okra (*Abelmoschus esculentus*).

Type

Holotype female was collected from Layyah 283/T.D.A by Abu Bakar Muhammad Raza on May 8, 2005 from bhindi (*Abelmoschus esculentus*), paratype 3 females, collection data same. All specimens were deposited in Acarology Laboratory, Department of Agri. Entomology, University of Agriculture Faisalabad.

Remarks

This new species closely resembles *N. bheraensis* Chaudhri, Akbar & Rasool but both differ on the basis of the following characters.

- 1) Dorsal shield with 5 pairs visible pores in *N. bheraensis* Chaudhri, Akbar & Rasool, while it has 2 pairs in this new species.
- 2) Chelicerae movable digit with one tooth in *N. bheraensis* Chaudhri, Akbar & Rasool while it is without teeth in this new species.
- 3) Chelicerae fixed digit with 8 teeth in *N. bheraensis* Chaudhri, Akbar & Rasool while it has 4 teeth in this new species.
- 4) Width of genital shield is as wide as that of ventrianal shield *N. bheraensis* Chaudhri, Akbar & Rasool while it is wider than the width of ventrianal shield in this new species.
- 5) Ventrianal shield is rectangular in *N. bheraensis* Chaudhri, Akbar & Rasool while it is pentagonal in this new species.

Characters of this new species can also be compared with those of *N. tabularis* Chaudhri, Akbar & Rasool which is given below.

- 1) Setae Z4 smooth in *N. tabularis* Chaudhri, Akbar & Rasool while these are serrated in this new species.
- 2) Chelicerae movable digit with two teeth in *N. tabularis* Chaudhri, Akbar & Rasool while it is without teeth in this new species.

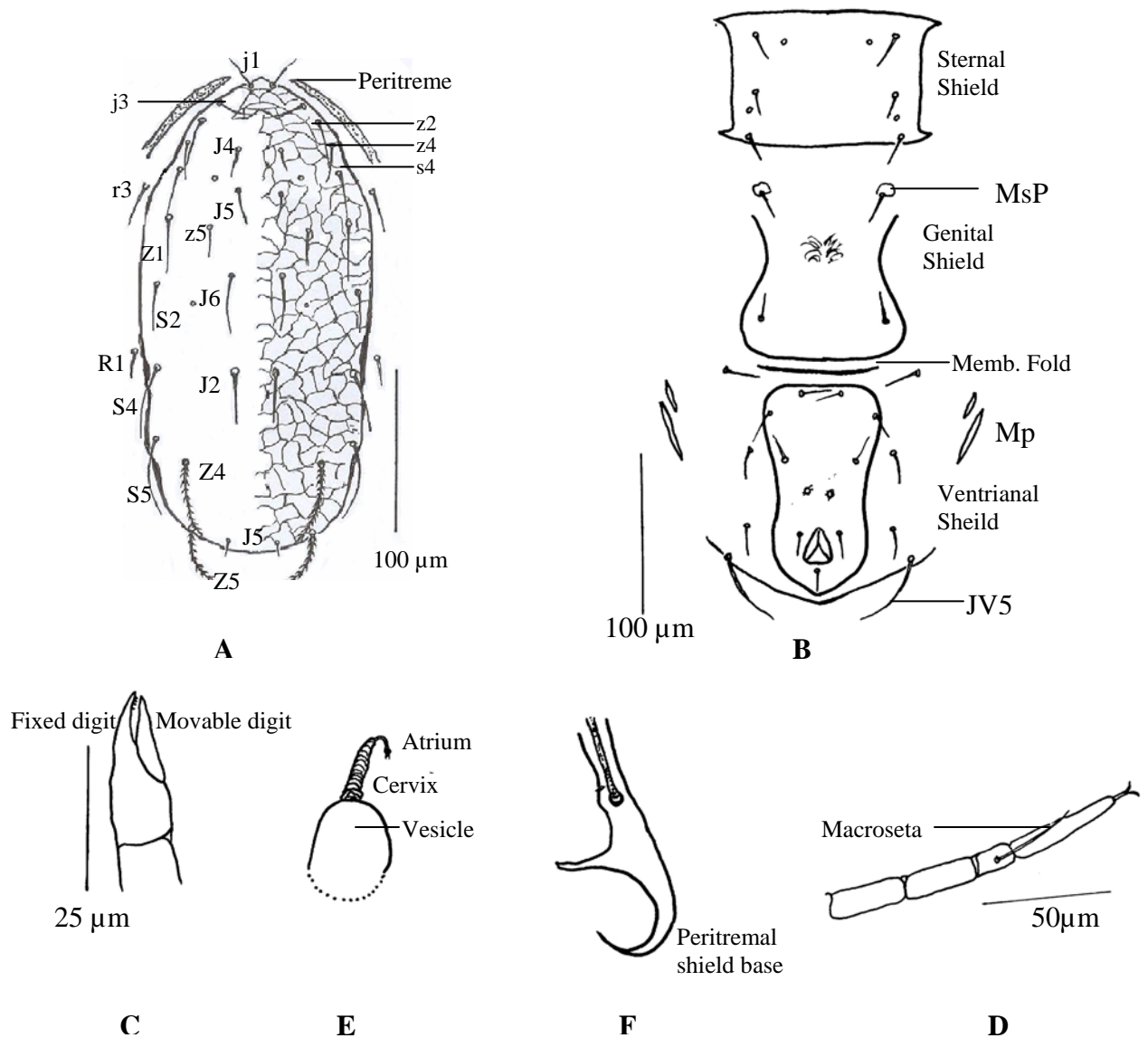


Fig. 1. *Neoseiulus abelmoschus*, new species; A, dorsal shield; B, ventral shields (sternal, genital and ventrianal shields); C, chelicerae; D, leg IV; E, spermatheca; F, peritreme.

- 3) Chelicerae fixed digit with 9 teeth in *N. tabularis* Chaudhri, Akbar & Rasool while it has 4 teeth in this new species.
- 4) Width of genital shield is as wide as that of ventrianal shield *N. tabularis* Chaudhri, Akbar & Rasool while it is wider than the width of ventrianal shield in this new species.
- 5) Ventrianal shield is quadrate in *N. tabularis* Chaudhri, Akbar & Rasool while it is pentagonal in this new species.

Neoseiulus hadiae, new species

Female

Dorsum

Dorsal shield smooth; 364 long; 221 wide (Fig. 2A); chelicerae 38 long, movable digit without teeth, fixed digit with 7 teeth (Fig. 2C). Dorsal shield oval near setae R1; 17 pairs setae and pores absent; all setae smooth and pointed; dorsal setae shorter than distance to setae next in line except

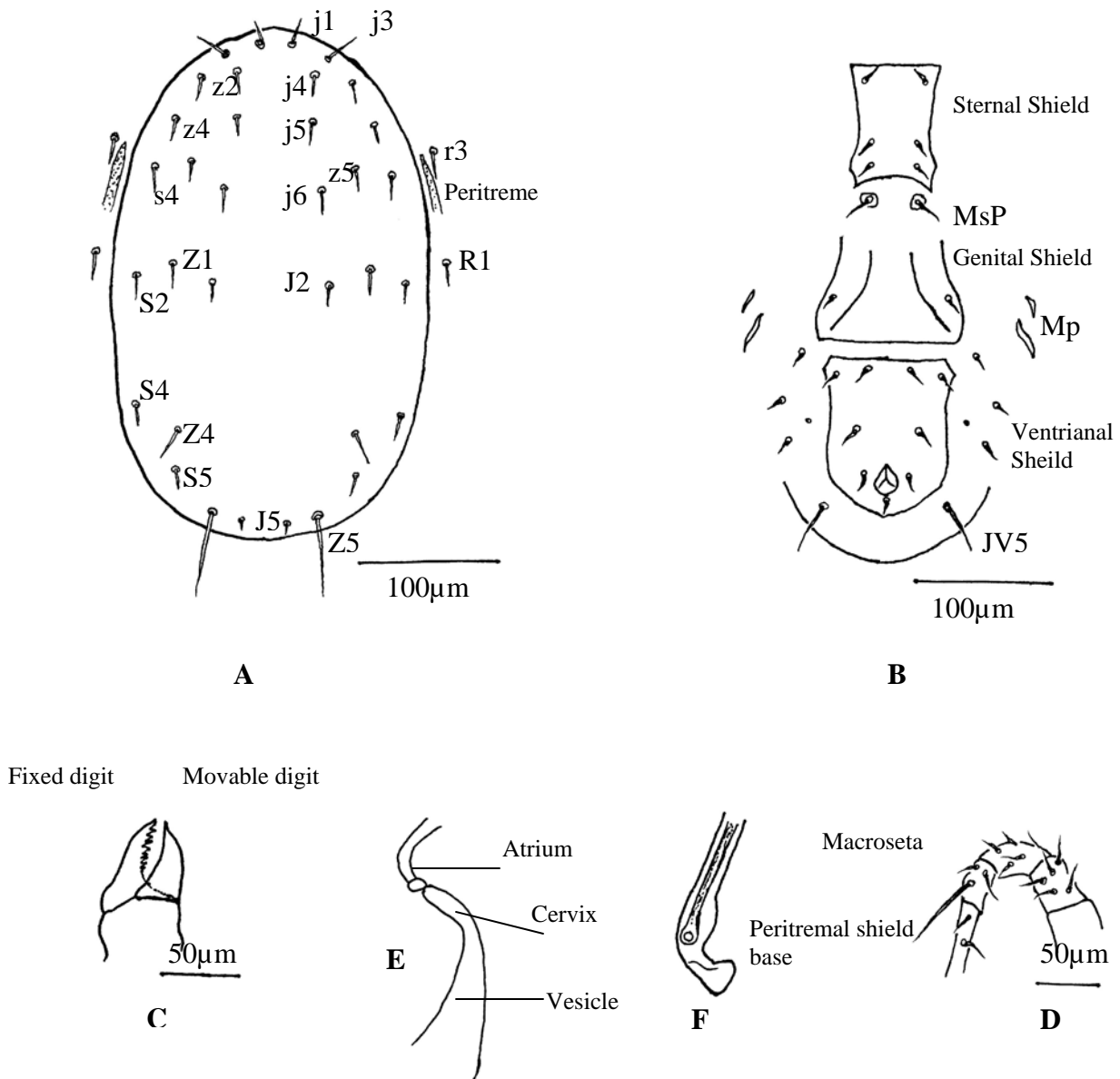


Fig. 2. *Neoseiulus hadiae*, new species; A, dorsal shield; B, ventral shields (sternal, genital and ventrianal shields); C, chelicerae; D, leg IV; E, spermatheca; F, peritreme.

setae Z5. Dorsal setae: j1=15, j4=j5 = 11, j6=J2= 13, j3= 19; z2=13, z4=11; s4=S2= 17, S4=S5=12; Z5=58, z5=11, Z1=14, Z4=23; r3=R1= 15. Peritreme extending upto setae r3 but not upto j1. The peritremal shield base is blunt not pointed as shown in Figure 2F.

Sternum

Sternal shield smooth; straight anteriorly but concave posteriorly; 84 long; 61 wide; 3 pairs setae (Fig.2B). Metasternal setae one pair each on separate platelets (Fig. 2B). Genital shield smooth; wider than the width of ventrianal shield; membranous

fold absent between genital and ventrianal shield. Ventrianal shield shield shaped, smooth and slightly concave laterally; 115 long; 91 wide; 3 pairs setae and without pores; 4 pairs setae and one pair pore on the membrane surrounding the ventrianal shield; setae JV5 smooth, 34 long; metapodal platelets (Mp) 2 pairs: primary 27, secondary 16 (Fig.2B).

Spermatheca

Cervix funnel like and atrium nodular (Fig. 2E).

Legs

One macroseta on leg IV basitarsus, 64 long (Fig. 2D).

Male

None in the collection.

Etymology

The name of the species derived after the name of first author's daughter's name (Hadia).

Type

Holotype female was collected from Chak # 100/6-R, Tahsil Harunabad, district Bahawalnagar by Abu Bakar Muhammad Raza on June 17, 2005 from undetermined host and deposited in Acarology Laboratory, Department of Agri. Entomology, University of Agriculture Faisalabad.

Remarks

This new species closely resembles *Neoseiulus congenitus* Chaudhri & Akbar but both differ on the basis of following characters.

- 1) Dorsal shield with 4 pairs visible pores in *Neoseiulus congenitus* but it is without pores in this new sp.
- 2) Peritreme extending upto setae j1 in *Neoseiulus congenitus* but it extends upto r3 in this new sp.
- 3) Chelicerae movable digit with one tooth in *Neoseiulus congenitus* but it is without teeth in this new sp.
- 4) Ventrianal shield striated and with one pair pore in *Neoseiulus congenitus* but it is smooth and lacking pores in this new sp.

Characters of this new species can also be

compared with those of *N. kamalensis* Bashir, Afzal & Ahmad which is given below.

- 1) Dorsal shield with one pair visible pore in *N.kamalensis* Bashir, Afzal & Ahmad while pores absent in this new species.
- 2) Peritreme reaching upto setae j1 in *N. kamalensis* Bashir, Afzal & Ahmad while it is reaching upto setae r3 in this new species.
- 3) Chelicerae movable digits with 4 teeth in *N. kamalensis* Bashir, Afzal & Ahmad while it is without teeth in this new species.
- 4) Chelicerae fixed digit absent in *N.kamalensis* Bashir, Afzal & Ahmad while it is with 7 teeth in this new species.
- 5) Genital shield shorter in width than ventrianal shield in *N. kamalensis* Bashir, Afzal & Ahmad while it is wider than ventrianal shield in this new species.
- 6) Shape of ventrianal shield is quadrate in *N.kamalensis* Bashir, Afzal & Ahmad while it is shield shaped in this new species.

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