

Contribution to the Fauna of Family Phytoseiidae (Acari) from Pakistan

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Abstract.- Mites belonging to the family Phytoseiidae are renowned bio-control agents for the plant feeding mites and small soft bodied insects. As a result of thorough survey of different localities of Pakistan, two new species *Phytoseius (Phytoseius) pactus* and *Phytoseius (Phytoseius) diverto* were collected from Changa Manga and Choa Saiden Shah. Holotypes were deposited in the Acarology Research Laboratory, Department of Agri. Entomology, University of Agriculture, Faisalabad. Specimens were mounted on the glass slides with the help of Hoyer's medium and identified with the help of phase contrast microscope. These specimens were compared with the already described species. Ceremonial description, illustration of main body parts, host range and comparison remarks are also given.

Key words: Acari, mites, Phytoseiidae.

INTRODUCTION

Mites belonging to the family Phytoseiidae are found to predate upon harmful mites and other insects (Canlas *et al.*, 2006). The subgenus *Phytoseius (Phytoseius) Ribaga* is an important subgenus which is present in abundance in Pakistan (Afzal *et al.*, 2008). They are known to act as predators of the phytophagous mites particularly on Tetranychids, Eriophids and small insects. They have also been found feeding on aphids, scale insects, thrips, whitefly and other small arthropods (Evans, 1992). This genus was erected by Ribaga (1904) with *Gamasus plumifer* Canestrini and Fanzago as its type species. Major contribution in the taxonomy of this subgenus includes the research work of Muma and Denmark (1968, 1970), Gupta (1977), McMurtry and Morases (1991), Walter (1992), Chant and McMurtry (1994), Yoshida-Shaul and Chant (1995), Chinniah and Mohanasundaram (2001), Furtado *et al.* (2005) and Ehara (2005) world wide.

From Pakistan, Chaudhri (1973), Chaudhri *et al.*, (1979) have described 4 and 1 new species in this subgenus respectively. Shahid *et al.* (1982), Khan *et al.* (1990), Afzal *et al.* (2000, 2005), Afzal

and Akbar (2005), Afzal and Bashir (2007) each, added two new species, Afzal *et al.* (2006) and Afzal *et al.* (2008) each described one new species in this genus while two new species are being added in this manuscript by the present authors thus, making a total of 21 species of the sub genus *Phytoseius (Phytoseius) Ribaga* from Pakistan.

MATERIALS AND METHODS

Survey and collection of the mites of the subgenus *Phytoseius (Phytoseius) Ribaga* was conducted from Punjab. Different plants were examined thoroughly for mites of the genus *Phytoseius*. Different plant parts like leaves, soft branches and inflorescence were beaten on white paper. The mites of the family Phytoseiidae were sorted with the help of field lens and preserved in small glass vials having 50% alcohol and few drops of glycerin.

The preserved specimens were permanently mounted on the microscopic slides by using the Hoyer's medium prepared for this purpose in laboratory. These permanent mounts were studied under the phase contrast microscope. The drawings of different parts of the body like dorsal shield; chelicera, sternal, genital and ventrianal shields; spermatheca; peritremal shield base and Leg IV were prepared by using an ocular grid. These specimens were identified with the help of literature and existing keys of Afzal *et al.* (2000, 2005, 2006,

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2007 and 2008). The Garman System (Garman, 1948) of setal nomenclature was being followed previously, but recently it has been changed to Lindquist-Evans system (Rowell *et al.*, 1978). The authors have followed this system in this manuscript. All the measurements are given in μm .

RESULTS AND DISCUSSION

Phytoseius (Phytoseius) pactus, new species (Fig. 1)

Female

Dorsum

Dorsal shield 310 long, 165 wide, with reticulations present in between seta $j6$ and $Z4$, concave posterior to seta $s6$. Dorsal shield with 2 pairs pores and 15 pairs setae (Fig. 1A). Chelicera 23 long, movable digit with 1 tooth, fixed digit with 2 teeth (Fig. 1-B). Dorsal and sublateral setae measuring: $j1$ 35, $j3$ 68, $j4 = j5 = j6$ minute, $J5$ minute; $z2$ 18, $z3$ 23, $z4$ 25, $z5$ minute, $Z4$ 105, $Z5$ 88; $s4$ 148, $s6$ 85; $r3$ 48; $j3 > j3 - z2$, $z2 > z2 - z3$, $z3 > z3 - z4$, $Z4 > Z4 - Z4$. All dorsal setae serrate except $j4$, $j5$, $j6$, $J5$, $z2$, $z4$ and $z5$ being simple. Peritreme reaching upto seta $j1$ (Fig. 1A). Peritremal shield base recurved (Fig. 1E).

Venter

Sternal shield with deeply concave margins having 3 pair simple setae, seta $St1 = St1-St2$, $St2 < St2-St3$. Metasternal setae 1 pair on membrane. Genital shield 103 wide, much wider than ventrianal shield, with 1 pair simple setae. Ventrianal shield longer than wide, 103 long, 60 wide, 33 apart from genital shield, membranous fold absent. Ventrianal shield with 3 pairs pre anal setae almost in a semicircular row, 1 pair para anal and 1 post anal seta, all simple, no pore on the shield. Seta $JV5$ thick, barbed 65 long. Metapodal platelets 1 pair primary, 25 long (Fig. 1C). Spermatheca poculiform, atrium nodulated with long major duct (Fig. 1D).

Legs

Macrosetae present on leg IV, tibia, basitarsus and distitarsus measuring 60, 25 and 25 in length, respectively. All setae simple and setaceous (Fig. 1-F).

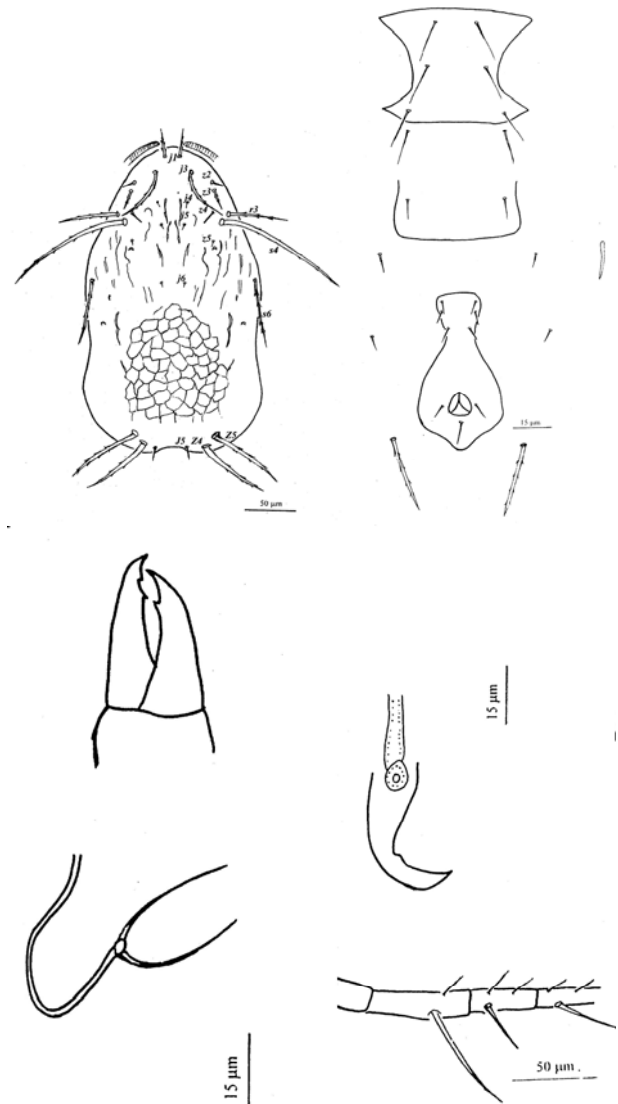


Fig. 1. *Phytoseius (Phytoseius) pactus*, n. sp. (Female); A, dorsal shield; B, chelicera; C, sternal, genital and ventrianal shields; D, spermatheca; E, peritremal shield base; F, leg IV.

Male

Not came in collection.

Type

Holotype female collected Choa Saiden Shah (3500 ft) from unidentified host plant no. 7/95 on June 29, 1995 (Muhammad Afzal), paratypes 2

females, same collection data, five females collected Changa Manga from Cucumber (*Cucumis sativa*) on September 9, 1995. All deposited in the Acarology Research Laboratory, Department of Agri. Entomology, University of Agriculture, Faisalabad, Pakistan.

Remarks

Phytoseius (Phytoseius) pactus, new species is closely related to *Phytoseius (Phytoseius) gleba* Afzal Bashir and Khan due to following characters:

1. Setae $j3$ extending base of setae $z4$ in this new species while in *P. gleba* the setae $j3$ not extending base of setae $z4$.
2. Macro setae are present on leg IV in this new species as against absent in *P. gleba*.
3. Cheliceral fixed digit with three teeth in *P. gleba* while in this new species cheliceral fixed digit with two teeth.
4. Setae $z2$ simple in this new species while serrated in *P. gleba*.

This new species also closely relates with *Phytoseius (Phytoseius) ferax* Afzal, Akbar and Qayyum but both the species differ on the basis of following characters:

1. Setae $s6$ serrate in this new species but these setae are simple in *Phytoseius (Phytoseius) ferax*.
2. Preanal setae on ventrianal shield, 3 pairs in this new species but one pair in *Phytoseius (Phytoseius) ferax*.
3. A membranous fold absent between genital and ventrianal shields in this new species but it is present in *Phytoseius (Phytoseius) ferax*.
4. Chelicerae fixed digits with two teeth in this new species but these are three in *Phytoseius (Phytoseius) ferax*.

Phytoseius (Phytoseius) diverta, new species (Fig. 2)

Female

Dorsum

Dorsal shield 290 long, 153 wide, with reticulate elements near seta $s6$ with lateral margins and posterior to seta $j6$ upto caudal end. Dorsal

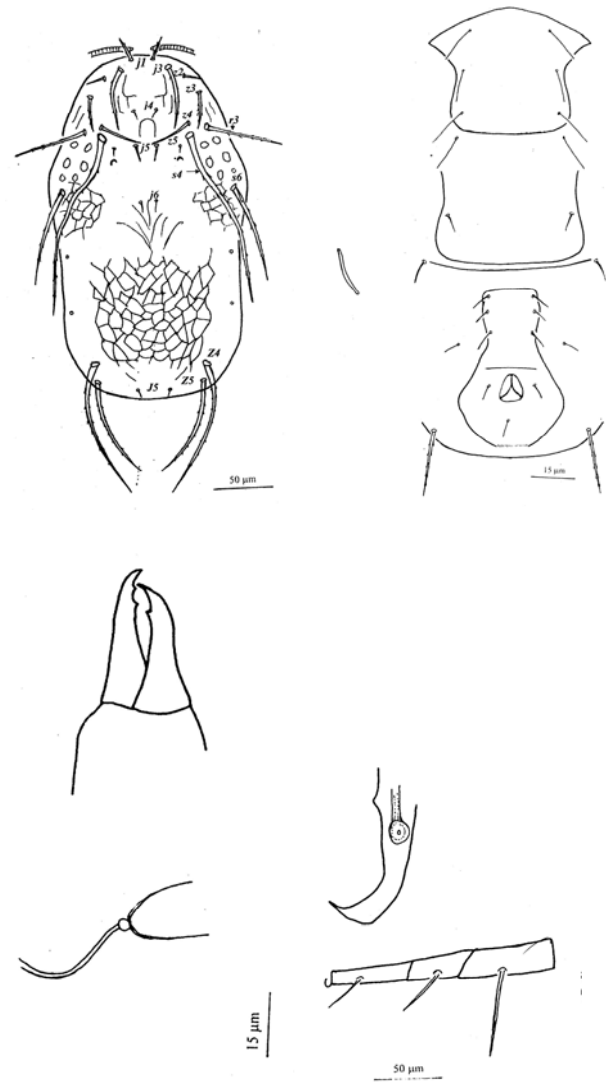


Fig. 2. *Phytoseius (Phytoseius) erema*, n. sp. (Female); A, dorsal shield; B. chelicera; C, sternal, genital and ventrianal shields; D, spermatheca; E, peritremal shield base; F, leg IV.

shield concave near $s6$ with 3 pairs pores and 15 pairs setae (Fig. 2A). Chelicera 20 long, movable digit with 1 tooth, fixed digit with 2 teeth (Fig. 2B). Dorsal and sublateral setae measuring: $j1$ 28, $j3$ 63, $j4 = j5 = j6$ minute, $J5$ minute; $z2$ 23, $z3$ 35, $z4$ 38, $z5$ minute, $Z4$ 108, $Z5$ 83; $s4$ 150, $s6$ 88; $r3$ 53; $j3 > j3 - z2$, $z2 > z2 - z3$, $z3 > z3 - z4$, $Z4 > Z4 - Z5$ being simple. All dorsal setae serrate except $j4$, $j5$, $j6$, $J5$, $z2$, $z4$ and $z5$. Peritreme reaching beyond seta $j1$

(Fig. 2A). Peritremal shield base recurved, with pointed tip (Fig. 2E).

Venter

Sternal shield with 3 pair simple setae, seta $St1 < St1-St2$, $St2 < St2-St3$. Metasternal setae 1 pair on membrane. Genital shield 75 wide, wider than ventrianal shield, with 1 pair simple setae. Ventrianal shield longer than wide, 93 long, 53 wide, 18 apart from genital shield, a membranous fold present between genital and ventrianal shields, ventrianal shield with 3 pairs pre anal setae almost in a vertical row, 1 pair para anal and 1 post anal seta, all simple, no pore on the shield. Seta $JV5$ thick, barbed 63 long. Metapodal platelets 1 pair primary, 33 long (Fig. 2C). Spermatheca poculiform with long major duct (Fig. 2D).

Legs

Macrosetae present on leg IV, tibia, basitarsus and distitarsus measuring 55, 28 and 25 in length, respectively, all setaceous (Fig. 2F).

Male

Not came in collection.

Type

Holotype female collected Khuzdar (Baluchistan) from Bottle gourd (*Langenaria siceraria*) on 25.xi.1996 (Afzal), paratypes 5 females, same collection data. All deposited in the Acarology Research Laboratory, Department of Agri. Entomology, University of Agriculture, Faisalabad, Pakistan.

Remarks

Phytoseius (Phytoseius) diverto, new species can be separated from *Phytoseius (Phytoseius) statos*, Afzal, Bashir and Akbar on account of the following points to which it is closely related:

1. Cheliceral movable digit without teeth in *P. statos* but with 2 teeth in this new species.
2. Peritremal shield base extending beyond the base of seta $j1$ in this new species while it is not reaching to seta $j1$ in *P. statos*.
3. Peritremal shield base recurved, with pointed tip in this new species as against recurved with rounded tip in *P. statos*

This new species also closely relates with *Phytoseius (Phytoseius) mancus* Afzal, Akbar and Qayyum but both the species differ on the basis of following characters:

1. Pilus dentilis on fixed cheliceral digits absent in this new species but it is present in *Phytoseius (Phytoseius) mancus*.
2. Setae $z2$ is simple in this new species while it is serrated in *Phytoseius (Phytoseius) mancus*.
3. Setae $s4$ 150 μm and $s6$ 88 μm in this new species but these are 70 μm and 85 μm respectively in *Phytoseius (Phytoseius) mancus*.

REFERENCES

- AFZAL, M. AND AKBAR, S., 2005. Two new species of the subgenus *Phytoseius* Ribaga (*Phytoseius*: Phytoseiidae: Acarina) from hilly areas of Pakistan. *Acarologia*, **45**: 253-256
- AFZAL, M., BASHIR, M. H. AND SABRI, M. A., 2005. Two new species of the sub genus *Phytoseius (Phytoseius)* Ribaga from Chitral, Pakistan. *Pak. Entomol.*, **27**: 77-81.
- AFZAL, M., BASHIR, M.H. AND KHAN, B.S., 2008. Description of a new species *Phytoseius (Phytoseius) gleba* (Acari: Phytoseiidae) from Punjab. *Pak. Entomol.*, **30**: 95-99.
- AFZAL, M., AKBAR, S. AND QAYYUM, S., 2000. Two new species of the subgenus *Phytoseius* Ribaga (*Phytoseius*: Phytoseiidae: Acarina) from Pakistan. *Pakistan J. Zool.*, **32**:251-255.
- AFZAL, M., BASHIR, M.H., AKBAR, S. AND KHAN, B.S., 2006. Identity and distribution of a new phytoseiid (Acari) mite from Pakistan. *Pak. Entomol.*, **28**: 73-75
- AFZAL, M., BASHIR, M.H. AND KHAN, B.S., 2008. Comparison of life cycle parameters of *Phytoseius gleba* (Acari: Mesostigmata) on three phytophagous host Species. *Integr. Acarol., Proc. 6th Cong. Eur. Assoc. Acarol., Montpellier, 21-25 July, 2008*. 415-419.
- AFZAL, M. AND BASHIR, M.H., 2007. Collection of new species of the subgenus *Phytoseius (Phytoseius)* Ribaga from coastal and subtropical continental low lands of Pakistan. *Pak. J. agric. Sci.*, **44**: 141-145
- CANLAS, L.J., AMANO, H., OCHIAI, N. AND TAKEDA, M., 2006. Biology and predation of Japanese strain of *Neoseiulus californicus* (McGregor) (Acari: Phytoseiidae). *Syst. appl. Acarol.*, **11**: 141-157
- CHANT, D.A. AND McMURTRY, J.A., 1994. A review of the subfamilies Phytoseiinae and Typhlodrominae (Acari:Phytoseiidae). *Int. J. Acarol.*, **20**: 223-310.

- CHAUDHRI, W.M., 1973. Descriptions of five new species of the genus *Phytoseius* Ribaga from Pakistan (Acarina: Phytoseiidae). *Pakistan J. Zool.*, **5**: 79-86.
- CHAUDHRI, W. M., AKBAR, S. AND RASOOL, A., 1979. Studies on the predatory leaf inhabiting mites of Pakistan. *U.A.F. Tech. Bull.*, **2**, 234 pp.
- CHINNIAH, C. AND MOHANASUNDARAM, M., 2001. New species of acarine fauna (Acarina: Mesostigmata) from Shevroy Range of Eastern Ghats of Tamil Nadu, India. *Zoos Print J.*, **16**: 523-531.
- EHARA, S., 2005. A collection of Phytoseiid mites (Acari: Phytoseiidae) from Java with description of a new species. *Acta Arachnol.*, **54**: 31-39.
- EVANS, G.O., 1992. *Principles of acarology*. C.A.B. Interna. Univ. Press, Cambridge, U.K., pp. 563.
- FURTADO, I.P., KREITER, S., DE MORAES, G.J., TIXIER, M.-S., FLECHTMANN, C.H.W. AND KNAPP, M., 2005. Plant mites (Acari) from northeastern Brazil, with descriptions of two new species of the family Phytoseiidae (Mesostigmata). *Acarologia*, **45**: 131-143.
- GARMAN, P., 1948. Mite species from apple trees in Connecticut. *Connecticut Agric. Expt. Sta. Bull.*, **520**, 1-27.
- GUPTA, S.K., 1977. New species and records of *Typhlodromus* and *Phytoseius* from Eastern India (Acarina: Phytoseiidae). *Ind. J. Acarol.*, **2**: 1-11.
- KHAN, M. H., CHAUDHRI, W. M. AND KHAN, A.S., 1990. Two new species of subgenus *Phytoseius* Ribaga (*Phytoseius*: Phytoseiidae: Acarina) from Pakistan. *Pak. Entomol.*, **12**: 57-59.
- McMURTRY, J.A. AND MORAES, G.J., 1991. Two new Phytoseiidae (Acari: Mesostigmata) from Zimbabwe with new records of other species. *Int. J. Acarol.*, **17**: 21-27.
- MUMA, M. H AND DENMARK, H. A., 1968. Some generic description and new changes in the family Phytoseiidae (Acarina: Mesostigmata). *Fla. Ent.*, **51**: 229-240.
- MUMA, M. H. AND DENMARK, H. A., 1970. Arthropods of Florida and neighbouring land areas, Phytoseiidae of Florida. *Bur. Ent. Contrib.*, **148**, 1-5150.
- RIBAGA, C., 1904. Gamasidi Planticoli. *Riv. Pat. Veg.*, **10**: 175-178.
- ROWELL, H. J., CHANT, D.A., AND HANSELL, R.I.C., 1978. The determination of setal homologies and setal patterns on the dorsal shield in the family Phytoseiidae (Acarina: Mesostigmata). *Canad. Entomol.*, **110**: 859-876.
- SHAHID, M., SIDDIQUI, M. N. AND CHAUDHRI, W. M., 1982. Three new predatory mites of the genus *Phytoseius* Ribaga (Acarina: Phytoseiidae) from Pakistan. *Pak. Entomol.*, **4**: 47-56.
- WALTER, D. E., 1992. Leaf surface structure and the distribution of *Phytoseius* mites (Acarina: Phytoseiidae) in South-Eastern Australian Forests. *Aust. J. Zool.*, **40**: 593-603.
- YOSHIDA-SHAUL, E. AND CHANT, D. A., 1995. The Identity of *Phytoseius macropilis* (Banks) (Acari: Phytoseiidae), with a note on its distribution. *Canad. J. Zool.*, **73**: 1199-1206.

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