

Nematodes associated with datepalm orchards of Kairpur district Sindh, Pakistan

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Abstract

Nemicfauna survey from eight sites viz., Khairpur, Kingri, Kot Diji, Faiz Gunj, Thari Mir Wah, Gambat, Sobhodero and Nara revealed that twenty five plant parasitic and seven free-living soil nematode species associated with date palm plantations in district Khairpur, Sindh, Pakistan. Population density and frequency of all nematodes varied considerably at all surveyed sites. Occurrence of plant parasitic nematodes was found high at Gambat (33.3%) and low in Kingri (15.38%). In free-living soil nematodes Nara has found high (10%) and low in Kingri (3.84%). The dendrogram indicted that there was 4 groups of 8 localities in relation to 32 nematode species. Morphological and taxonomical studies indicated that all nematode genera and species have been identified and recorded for the first time from date palm orchards of Khairpur district. *Merlinius nothus* Allen, (1955) Siddiqi, 1980, is reported as a new record nematode species in Pakistan. It is briefly redescribed and illustrated herein.

Date palm (*Phoenix dactylifera* L.), local name “Khajur” belongs to the family Arecaceae or Palmae. Khairpur is located in the northern part of the Sindh province of Pakistan. It lies between 26-11° and 27-44° North latitude and 68-12° and 7-11° East longitude. District Khairpur is peculiar in date production, because of its typical climatic conditions. Date crop is cultivated in various parts of Pakistan including Bannu, Multan, Dera Ghazi Khan, Panjyar and Khairpur (Khushk, 1988). It can be grown in coastal, tropical and arid regions where irrigation water is available (Luqman *et al.*, 2002). Date varieties (300) are grown here and from commercial point of view “Aseel” is the most important (Kakar *et al.*, 2010). Pakistan ranks seventh in the date production in world (FAOSTAT, 2011). Pakistani dates are famous for the high quality of nutrients. The area under cultivation of dates in Pakistan and Sindh was 90.1 and 32.7 thousand hectares and production was 522.2 and 268.6 thousand tonnes, respectively (Anonymous, 2010-11).

About 30% of production may potentially be lost as a result of diseases and pests (Khushk & Mal, 2005). Among pests, study of plant parasitic nematodes associated with date palm is reported by Khan & Bilquees (1985); Maqbool (1986);

Khan *et al.*, (1987); Maqbool (1988); Shahina & Maqbool (1990); Nasira & Maqbool (1992). Moreover, Maqbool & Zaki (1992) provided the comprehensive information regarding the nematological research of Pakistan while Maqbool (1992) and Maqbool & Shahina (2001) compiled the list of nematodes found associated with numerous plants including the date palm in different localities of Pakistan. Khan *et al.*, (2006), Samad (2006) and Islam (2007) reported the date palm nematodes from Balochistan province. However, no information is available for date palm nematode records of Khairpur district and the present study ahead step to collect information.

Materials and Methods

Soil and root samples were collected during survey of date palm orchards from the 8 sites of district Khairpur Sindh; Pakistan, viz., Khairpur, Kingri, Kot Diji, Faiz Gunj, Thari Mir Wah, Gambat, Sobhodero and Nara. Composite soil and root samples randomly collected from the rhizospheric region of plants on each field. Soil samples with roots placed separately in plastic bags, labelled, kept in ice chest box and brought to laboratory for processing.

Samples were processed for the extraction of nematodes according to the Cobb's sieving and decanting method followed by Baermann funnel method (Hooper, 1990). Roots were examined under binocular microscope for gall formation and root-knot nematodes. Cyst nematodes were also examined in the soil suspension under binocular microscope. The plant parasitic and soil nematode species were identified on key basis as provided by Siddiqi (2000) and Jairajpuri & Ahmad (1992), respectively. Cluster analysis shown by a dendrogram which was generated using computer software Minitab separated group species related to localities.

Results and Discussion

Samples were collected from date palm orchards at eight different sites of Khairpur district viz., Khairpur, Kingri, Kot Diji, Faiz Gunj, Thari Mir Wah, Gambat, Sobhodero and Nara.

Microscopic studies of these samples resulted in the identification of twenty five plant parasitic nematodes belonging to 15 genera, 10 families and 3 orders and seven free-living soil nematode species of 7 genera, 6 families and 3 orders. These nematodes were present in varied density and frequency in surveyed sites. Occurrence of plant parasitic nematodes (Fig. 1) was found high at Gambat (33.3%) and low in Kingri (15.38%). In free-living soil nematodes (Fig. 2) Nara has found high (10%) and low in Kingri (3.84%).

Morphological and taxonomical studies indicated that all nematode genera and species have been identified and recorded for the first time from date palm orchards of Khairpur district and presented in below list. *Merlinius nothus* Allen, (1955) Siddiqi, 1980 is reported as a new record nematode species of Pakistan identified during the present study. It is redescribed and illustrated herein.

The cluster analysis (dendrogram) indicted that there was 4 groups of 8 localities in relation to 32 nematode species. Three localities viz., Khairpur, Kingri and Gambat formed group 1, Faiz Gunj

and Thari Mir Wah group 2, Kot Diji and Shoho Dero group 3 and Nara of group 4 on the basis of similar nematode species (Fig. 3).

Merlinius nothus (Allen, 1955) Siddiqi, 1980 (Fig. 4 A-F)

Measurements: Table 1.

Description (Female): Body ventrally arcuate upon fixation, tapering towards the extremities; maximum width 17-20 μm at mid body. Cuticle and subcuticle with distinct transverse striae 0.8-1.0 μm apart near mid body; lateral fields with six incisures, number of incisures fewer towards extremities. Lip region continuous with body contour, hemispherical 7-8 μm wide and 3-4 μm high with six fine distinct annules. Stylet slender, moderately developed with attenuated cone, conus just longer than shaft; stylet knobs moderately developed, rounded posteriorly, about 3-3.5 across. Orifice of dorsal oesophageal gland 2-3 behind stylet base. Median oesophageal bulb oval with prominent valve plates. Isthmus slender, encircled with nerve ring at about its mid point, 59-63 μm from head end. Basal bulb pyriform offset from intestine 23-28 x 8-9 μm , with prominent oesophago-intestinal valve at base. Excretory pore usually at base of isthmus 82- 95 μm from anterior end, just behind hemizonid which is about 2-3 annules long. Deirid present at the level of basal bulb. Vulva a transverse slit, closed, vulval lips not elevated. Ovaries didelphic, outstretched, with oocytes in a single row, spermatheca rounded. Rectum less than anal body width. Tail straight to conoid with subhemispherical annulated terminus, 3.1-3.7 times anal body width long with 50-60 annules. Phasmid distinct, anterior to middle of tail, terminal hyaline portion 4 μm long.

Male: Not found.

Remarks: Morphometric data and description is based on the specimens collected from soil around the roots of date palm from Khairpur, Kingri and Thari Mirwah. The measurements of these specimens closely fit the original description of *Merlinius nothus* (Allen, 1955) Siddiqi, 1980.

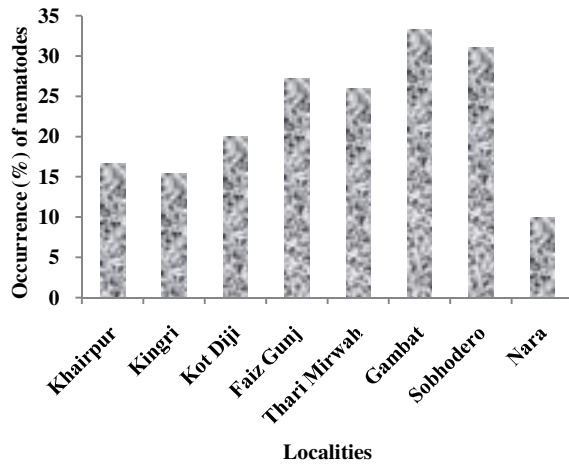


Fig. 1. Occurrence (%) of plant parasitic nematodes of surveyed sites of Khairpur.

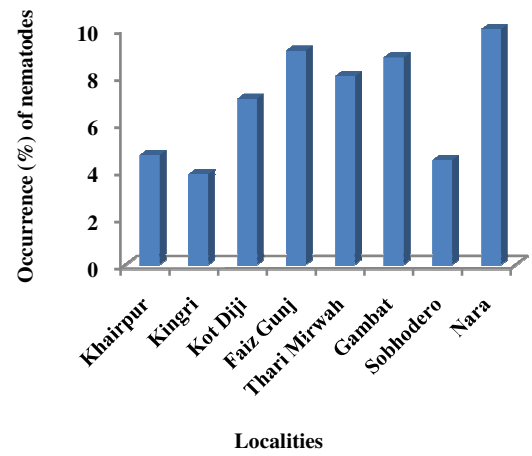
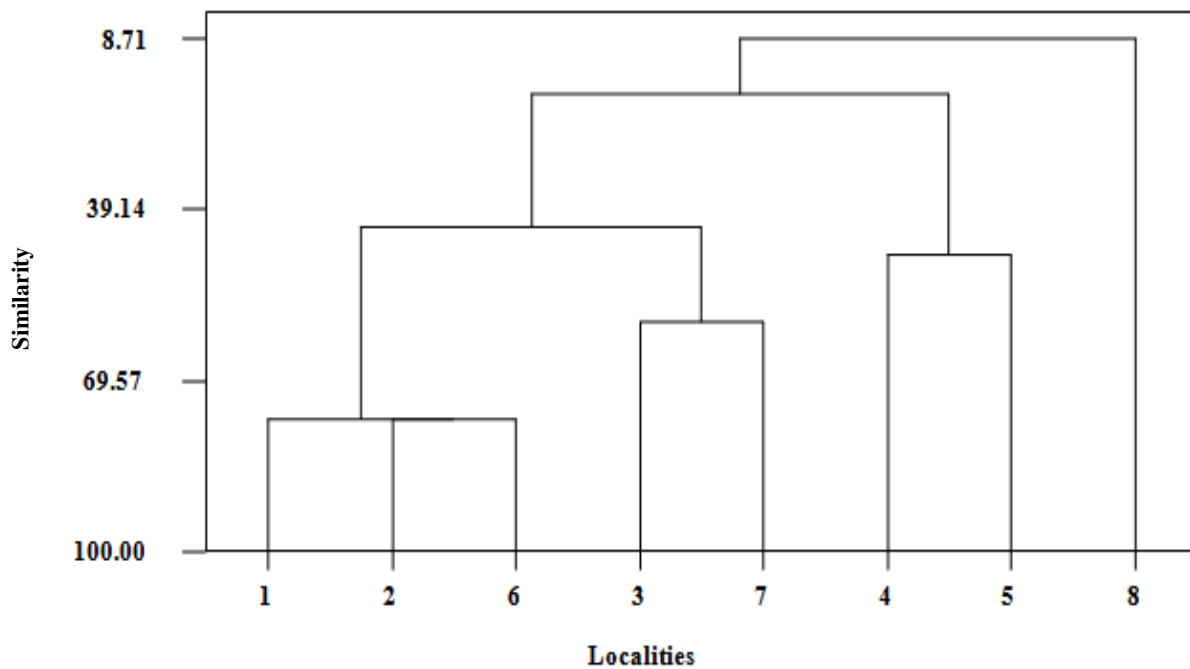


Fig. 2. Occurrence (%) of free-living soil nematodes of surveyed sites of Khairpur.



1= Khairpur, 2= Kingri, 3= Kot Diji, 4= Faiz Gunj, 5= Thari Mir Wah, 6= Gambat, 7= Sobhodoro, 8= Nara

Fig. 3. Dendrogram indicating groups of localities in relation to nematode species.

List of plant parasitic and free-living soil nematode species of date palm from Khairpur district.

- Aphelenchus avenae* Bastian, 1865
Aphelenchoides besseyi Christie, 1942
Helicotylenchus dihystera (Cobb, 1893) Sher, 1961
H. indicus Siddiqi, 1963
H. pseudorobustus (Steiner, 1914) Golden, 1956
Hemicriconemoides mangiferae Siddiqi, 1961
H. communis Edward & Misra, 1964
Heterodera mothi Khan & Hussain, 1965
Hirschmanniella gracilis (de Man, 1880) Luc & Goodey, 1964
H. oryzae (van Breda de Haan, 1902) Luc & Goodey, 1964
Hoplolaimus columbus Sher, 1963
H. indicus Sher, 1963
Longidorus pisi Edward, Misra & Singh, 1964
Meloidogyne incognita (Kofoid & White, 1919) Chitwood, 1949
Merlinius brevidens (Sturhan, 1966) Siddiqi, 1970
 **M. nothus* (Allen, 1955) Siddiqi, 1980
Pratylenchus penetrans Filipjev, 1936
P. thornei Sher & Allen, 1953
P. vulnus Allen & Jensen, 1951
Quinisulcius curvus (Williams, 1960) Siddiqi, 1970
Rotylenchulus reniformis Linford & Oliveira, 1940
Tylenchorhynchus annulatus Cobb, 1913
T. brassicae Siddiqi, 1961
T. gossypii Nasira & Maqbool, 1996
Xiphinema basiri Siddiqi, 1959
Axodorylaimus parvulus Thorne, 1939
Discolaimus texanus Siddiqi, 1964
Doryllium minor Jairajpuri, 1963
Ecumenicus monhystera (de Man, 1880) Thorne, 1974
Mesodorylaimus clavicaudatus (Thorne & Swanger, 1936) Andrassy, 1936
Mylonchulus contractus Jairajpuri, 1970
Oscheius karachiense n. sp.

*= New record species of Pakistan; All nematode species are new host records of Khairpur district Sindh, Pakistan.

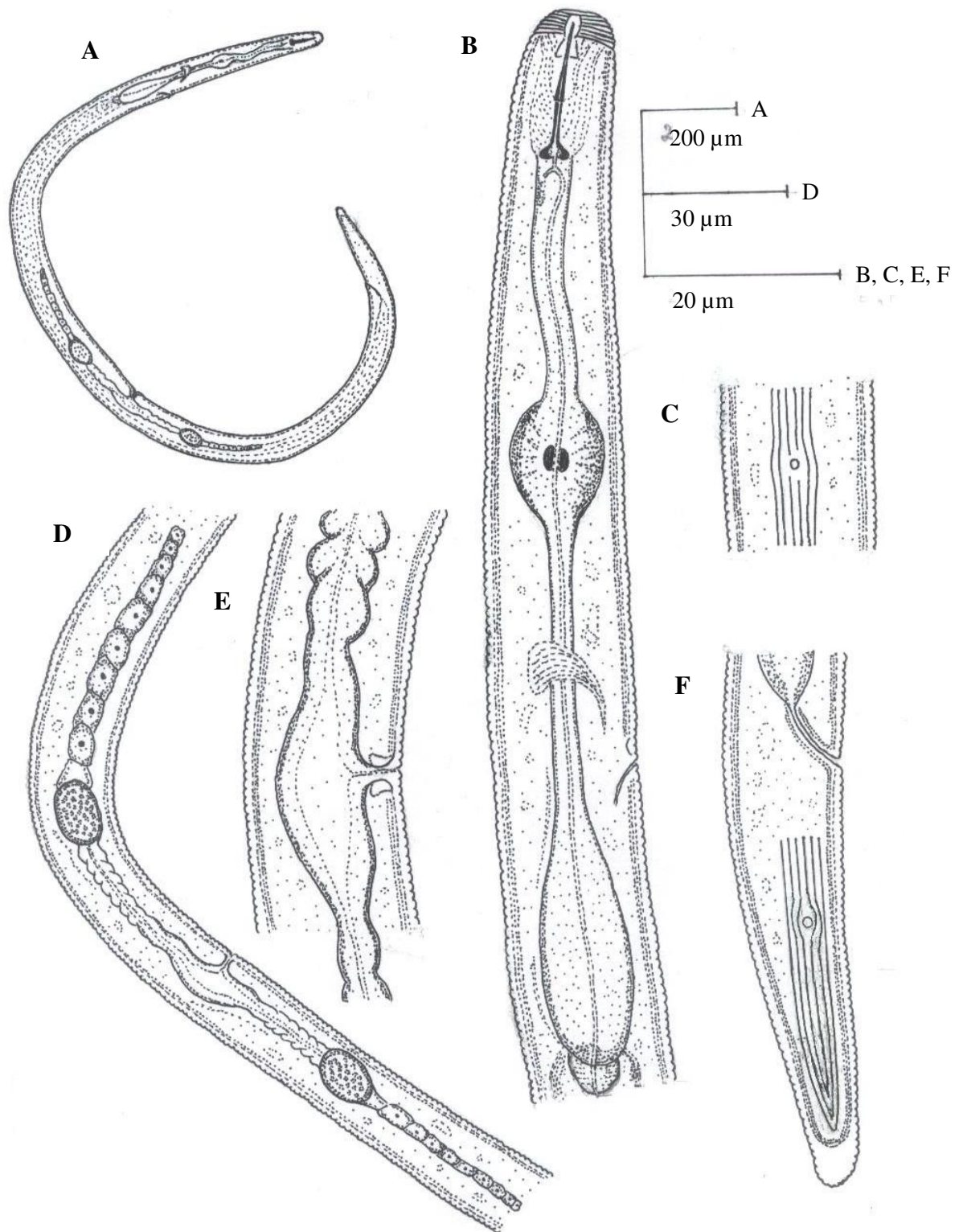


Fig. 4. (A-F). *Merlinius nothus*. A. Whole boy, B. Oesophageal region, C. Deirid at basal bulb region, D. Reproductive system, E. Vulval region, F. Tail region showing phasmid.

Table 1. Morphometric data of *Merlinius nothus*. All measurements are in μm .

Characters	Female (n= 10)
L	573.75 \pm 34.47 (526-607)
A	31.37 \pm 1.92 (29-33)
B	5.07 \pm 0.39 (4.5-5.5)
C	13.92 \pm 1.37 (12.5-15.5)
c`	3.42 \pm 0.25 (3.1-3.7)
V%	55.75 \pm 1.53 (54-57.5)
Body width at mid body	18.25 \pm 1.25 (17-20)
Anal body width	11.75 \pm 0.5 (11-12)
Head width	7.25 \pm 0.5 (7-8)
Head length	3.5 \pm 0.57 (3-4)
Oesophageal length	112 \pm 1.41(110-113)
Stylet length	15.2 \pm 0.44 (15-16)
Tail length	41.25 \pm 2.6 (39-45)
Tail annules	55 \pm 2.1 (52-60)

References

- Anonymous. 2010-11. *Pakistan Statistical Yearbook*. Pakistan Bureau of Statistics, Islamabad, Pakistan.
- FAOSTAT. 2011. Food and Agricultural commodities production.
- Hooper, D.J. 1990. Extraction and processing of plant and soil nematodes. In: Luc, M., Sikora, R.A. & Bridge, J. (Eds.). *Plant parasitic nematodes in tropical and subtropical agriculture*. CAB International, Wallingford, UK, 45-68 pp.
- Islam, S. 2007. *Management of plant parasitic nematodes associated with date-palm (Phoenix dactylifera L.) using common plants*. Ph. D. Thesis. Department of Zoology, University of Karachi, Karachi-75720, Pakistan, 133 pp.
- Jairajpuri, M.S. & Ahmed, W. 1992. *Dorylaimida, free-living, predaceous and plant parasitic nematodes*. E.J. Brill, Leiden, The Netherlands.
- Khan, A. & Bilqees, F.M. 1985. Stylet bearing nematodes associated with date palm in Thatta district. *Pakistan Journal of Zoology* 17, 299-300.
- Khan, A., Khanzada, A.K. & Aslam, M. 1987. Plant parasitic nematodes associated with date palm in Balochistan. *Pakistan Journal of Nematology* 5, 15-17.
- Khan, A., Shaukat, S.S., Soomro, M.H. & Samad, M.A. 2006. Nematodes associated with date-palm in Lasbela district, Balochistan, Pakistan. *Pakistan Journal of Nematology* 24, 191-197.
- Khushk, M.K. 1988. *Role of inorganic constituents in development of date fruit in Khairpur*. Ph. D. Thesis. University of Sindh Jamshoro, Pakistan.
- Luqman, N., Ihsan-ullah, A. & Khan, A. 2002. A farming survey for non-cultivation of date palm in district Karak. *Asian Journal of Plant Science* 1, 602-603.
- Khushk, A.M. & Mal, B. 2005. Date production under threat of moth disease. *Dawn Economic and Business Review* (July 3, 2005).
- Kakar, M.K., Nizamani, S.M., Rustamani, M.A. & Khuhro, R.D. 2010. Periodical lesser date moth infestation on intact and dropped fruits. *Sarhad Journal of Agriculture* 26, 393-396.
- Maqbool, M.A. 1986. *Classification and distribution of plant parasitic nematodes in Pakistan*. National Nematological Research Centre, University of Karachi, Karachi-75270, Pakistan, 58 pp.
- Maqbool, M.A. 1988. An overview of nematode problem and research in Pakistan. In: Maqbool, M.A., Golden, A.M., Ghaffar, A. & Krusberg, L.R. (Eds.). *Advances in Plant Nematology*. Proceedings of US-Pak International Workshop on Plant Nematology, National Nematological Research Centre, University of Karachi, Karachi-75720, Pakistan, 23-46 pp.
- Maqbool, M.A. & Zaki, M.J. 1992. *Annotated bibliography of plant parasitic nematodes in Pakistan (1947-1992)*. National Nematological Research Centre, University of Karachi, Karachi-75720, Pakistan, 172 pp.

- Maqbool, M.A. & Shahina, F. 2001. *Systematic and distribution: Biodiversity of nematode fauna in Pakistan*. National Nematological Research Centre, University of Karachi, Karachi-75270, Pakistan, 179 pp.
- Nasira, K. & Maqbool, M.A. 1992. *A monograph on stunt nematodes of Pakistan (Dolichodoridae)*. National Nematological Research Centre, University of Karachi, Karachi-75270, Pakistan, 111 pp.
- Shahina, F. & Maqbool, M.A. 1990. Distribution of corn cyst and cereal cyst nematodes in Pakistan. *International Nematology Network Newsletter* 7, 38-40.
- Samad, M.A. 2006. *Association and control of plant parasitic nematodes of date-palm in Balochistan province, Pakistan*. Ph. D. Thesis. Department of Zoology, University of Karachi, Karachi-75720, Pakistan, 142 pp.
- Siddiqi, M.R. 2000. *Tylenchida: Parasites of plants and insects*. 2nd Edition. CABI Publishing, Wallingford, UK, 833 pp.

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