



RESEARCH NOTE

A new report of a fly, *Melanagromyza* sp. (Diptera: Agromyzidae) on carrot (*Daucus carota* L.) from India

N. V. RAGHUNANDAN^{1*} and R. MANJUNATHA²

¹Department of Entomology, University of Agricultural Sciences, Gandhi Krishi Vignana Kendra, Bengaluru-560 065, India

²Department of Entomology, College of Sericulture, Chintamani, University of Agricultural Sciences, Gandhi Krishi Vignana Kendra, Bengaluru-560 065, India

*E-mail: nandannvraghu@gmail.com

ABSTRACT: We describe the economic damage caused by the infestation of carrot fly, *Melanagromyza* sp. (Diptera: Agromyzidae), on tap roots resulting in inferior quality carrots with lower marketable price. The study was conducted in major carrot growing districts of Karnataka, India, where adult fly activity commenced 25-27 days after sowing (DAS) and damage by maggots was noticed around 45 DAS. Taproots of 1 to 40 days old were free from the pest attack and the feeding damage prevailed up to 60 days in the field. The report highlights that the pest is widely distributed in all surveyed locations of Karnataka. Pest incidence ranged from 0.74 to 20.77 per cent, with the highest incidence recorded from Kolar in July.

Keywords: carrot fly, taproot, damage

Carrot (*Daucus carota* L.: Apiaceae) is a popular vegetable, ranking among the top ten widely cultivated vegetables globally. The plant originated from Afghanistan and Persia and is primarily grown in temperate climates, but it is also cultivated in tropical and subtropical regions. The optimal conditions for carrot cultivation include an elevation of 1500 meters or above and sufficient irrigation, allowing for year-round growth. The taproot, which is the edible part of the carrot, is a rich source of nutrients such as carotene, thiamine, riboflavin, niacin, and vitamin C. (Holland *et al.*, 1991). India produced a total of 2.13 million metric tonnes of carrots from an area of 1.18 lakh hectares. Haryana and West Bengal stand out as the top producing states of carrots in India (Anonymous, 2021a). Karnataka ranks 8th in total area and production with 4,833 hectares and 92,914 tonnes respectively (Anonymous, 2021b). Kolar and Chikkaballapur are the major carrot growing districts in Karnataka, where it is cultivated throughout the year with assured irrigation. Carrot hybrids like Taki's 999, Rado and Sayuri were predominant in these districts and their crop duration is 80-90 days.

Several insect pests have been reported on carrot *viz.*, aster leafhopper, *Macrostelus quadrilineatus* (Fobes); flea beetle, *Systema blanda* (Melsheimer); carrot weevil, *Listronotus oregonensis* (LeConte); aphid, *Myzuspersicae*

(Sulzer) and cutworm, *Agrotis* sp. from United States of America (Delahaut and Newenhouse, 1998); carrot aphid, *Cavariella aegopodii* (Scopoli) and *Semiaphisheraclei* (Takahashi); semilooper, *Thysanoplusia orichalcea* (Fabricius) and thrips, *Aeolothrips meridionalis* Bagnall from Jammu and Kashmir, India (Bhat and Ahangar, 2018). However, none of the studies ascertained the economic damage caused by these pests on carrot.

During our pest surveillance studies, we observed a significant economic loss of carrot in major growing areas of Karnataka due to infestation by a fly. The damage caused by the maggot of the fly led to severe injury to the taproot, resulting in the production of inferior quality carrots with lower marketable prices. To address this issue, a study was conducted to determine the current pest status of the fly in major carrot-growing areas of South India.

A series of roving surveys were conducted from December 2021 to July 2022 (Table 1) covering Kolar, Bengaluru Rural, and Chikkaballapur districts in Karnataka, as well as Krishnagiri and Nilgiris districts in Tamil Nadu. A total of 21 visits were made to these areas [Kolar (9 visits), Bengaluru Rural (3), Chikkaballapur (3), Krishnagiri (4), and Nilgiris (2)]. The team uprooted 150 carrots following a zig-zag pattern of sampling from one

Table 1. Incidence of carrot fly, *Melanagromyza* sp. in major carrot growing areas

District	Date	Location	Latitude	Longitude	Age of crop (Days)	Damage (%)
Karnataka						
Bengaluru Rural	02-01-2022	Kurubarahalli	13.327012°	77.605310°	78	0.84
	08-02-2022	Kumbalahalli	13.099595°	77.797099°	75	1.73
	22-05-2022	Muthagatti	12.691897°	77.715340°	72	12.2
Kolar	30-12-2021	Haraleri	12.989075°	77.990836°	57	1.12
	07-02-2022	Narasapura	13.148725°	78.000636°	55	0.74
	10-02-2022	Mirapanahalli	12.869137°	77.977854°	55	1.47
	25-03-2022	Turunasi	12.849614°	78.016033°	65	1.05
	28-03-2022	Kudiyanuru	12.938988°	77.958978°	64	1.48
	03-05-2022	Hosahalli	12.908325°	78.001336°	53	11.1
	20-05-2022	Hunasannahalli	12.982331°	78.167846°	63	11.2
Chikkaballapur	07-06-2022	Nagapura	12.886328°	77.979104°	82	12.15
	07-07-2022	Nanjapura	12.876184°	77.969233°	67	20.77
	01-03-2022	Hunegallu	13.492116 °	77.752719 °	80	17.88
	03-03-2022	Jeedarahalli	13.298123°	78.053325°	78	2.62
	03-03-2022	Hadigere	13.358987°	78.074939°	65	2.19
Tamil Nadu						
Krishnagiri	11-01-2022	Atturu	12.804390°	77.907100°	75	0.89
	06-02-2022	Saparapalli	12.844195°	78.051514°	77	8.18
	15-04-2022	Berigai	12.817619°	77.974007°	82	1.52
	30-06-2022	Athimugam	12.754815°	77.977165°	80	3.2
Nilgiris	30-01-2022	Fern Hill, Udakmandalam	11.394617°	76.697261°	105	0
	30-01-2022	Muthorai Palada, Udakmandalam	11.372513°	76.666689°	108	0

acre of field in each area, washing them thoroughly and examining them for damage symptoms and the different life stages of the pest. Pest incidence was calculated based on the symptoms observed and expressed as a percentage of damage.

During the survey, incidence of the carrot fly was found in all surveyed locations in Karnataka and only in Krishnagiri district of Tamil Nadu. The incidence rate varied between 0.74 to 20.77 per cent, with the highest incidence recorded in Kolar in July. Interestingly, the Nilgiris, which is a major carrot producing district in Tamil Nadu, did not report any incidence of the carrot fly during the survey. The pest responsible for the observed damage has been identified as the carrot fly, *Melanagromyza* sp. (Diptera: Agromyzidae). The adult carrot fly (Plate 1) is a small insect, measuring 2.3mm in length and 0.94mm in width, with a blue metallic

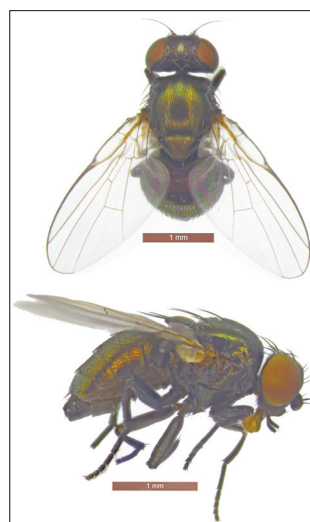


Plate 1. Adults of carrot fly, *Melanagromyza* sp.



Plate 2. Carrot damaged by maggots

shiny thorax and abdomen. Females possess a tube-like ovipositor, while males have a blunt abdomen.

The adult fly activity was commenced at 25-27 days after sowing (DAS) and peak activity recorded during 34-40 DAS. The mated females usually oviposited single egg on the stem of foliage. After hatching the early instar maggot feed through the stem and reached the taproot. The early instar maggot tunnel down the taproot resulting in production of white silvery mines on the surface of taproot, which is difficult to identify (hence, taproots were washed with water to clear off dirt). Tunneling by later instar maggot led to cracking of taproots usually at the shoulder portion. The early instar maggot moved downward, whereas the later instar maggot tunneled upward and pupated inside the mine closer to the base of carrot stem (Plate 2). The carrot fly completed one generation in one cropping period of 75 to 85 days. The taproots of developmental stage-I (1-25 days old) and II (26-40 days old) were free from carrot fly damage. Damage commenced from stage-III (41-60 days old) and prevailed till stage-V (70-90 days old). Since, carrot is a high value crop, any slight damage to taproot by maggot results in production of inferior quality carrots and drastically reduces the marketable value of the produce. The present study revealed that the pest caused an economic loss of rupees 18.30/- per kg of good quality carrots (Rupees 50/- per one kg of carrot as the market price, Anonymous, 2022). Further, our study suggested that the pest could be managed through installation of yellow sticky traps (10-12 numbers per acre) 20-25 DAS followed by application of soil insecticide at 30 and 40 DAS. Strict quarantine measures will prevent its spread to pest free areas.

The description of feeding damage and symptoms caused on carrot by the carrot fly are the first of its kind and this study marks the first report of *Melanagromyza* sp. on carrot from India.

ACKNOWLEDGEMENT

The authors are grateful to Dr. H. M. Yeshwanth, Curator, Collection Facility at National Centre for Biological Sciences, Bengaluru for identification of the insect.

REFERENCES

- Anonymous. 2021a. Area, Production and Yield of Carrot in India. <https://www.indiastatagri.com/table/agriculture/area-production-yield-carrot-india-2011-2012-2021-/962302>.
- Anonymous. 2021b. District-wise, Vegetable- Crop Statistics of Area, Production, Yield & Value of Horticultural Crops in Karnataka State. <https://horticulture.karnataka.gov.in/storage/pdf/Area%20and%20Production%202020-21/49-60.pdf>
- Anonymous. 2022. Vegetables Price in Kolar, Karnataka Daily price list <https://market.todaypricerates.com/Kolar-vegetables-price-in-Karnataka>.
- Bhat, D. M. and Ahangar, F. A. 2018. A Systematic checklist and species richness of insect pests associated with vegetable crops in Jammu & Kashmir State (India). *Journal of Entomology and Zoology Studies*, **6** (2): 328-338.
- Delahaut, K. A. and Newenhouse, A. C. 1998. Growing carrots, beets, radishes, and other root crops in Wisconsin: A guide for fresh worker growers. University of Wisconsin Extension. 10-16.
- Holland, B. Unwin, J. D. and Buss, D. H. 1991. Vegetables, herbs and spices: Fifth supplement to McCance and Widdowson's, London.

MS Received: 12 May 2023

MS Accepted: 10 June 2023