



Plant Archives

Journal homepage: <http://www.plantarchives.org>

DOI Url : <https://doi.org/10.51470/PLANTARCHIVES.2026.v26.supplement-2.229>

BIOLOGICAL ATTRIBUTES OF APHID, *Macrosiphoniella sanbornii* (Gillette) ON THREE DIFFERENT ORNAMENTAL HOST PLANTS

Nitheesha, Mengali^{1*} and Barad A. H.²

¹Department of Entomology, B. A. College of Agriculture, Anand Agricultural University, Anand-388 110, Gujarat, India

²Department of Plant Protection, College of Horticulture, Anand Agricultural University, Anand-388 110, Gujarat, India

*Corresponding author E-mail: mengalinitheesha24@gmail.com

(Date of Receiving : 31-03-2026; Date of Revision : 23-05-2026; Date of Acceptance : 11-06-2026)

ABSTRACT

An experiment was conducted under the laboratory conditions to study the biology of aphid, *Macrosiphoniella sanbornii* (Gillette) (Homoptera: Aphididae) on chrysanthemum from December, 2025 to January, 2026. The biology of aphid on three hosts indicated that the total life span ranged from 13.52±2.55 days on chrysanthemum, 13.08±2.19 days on marigold and 12.68±2.11 days on zinnia. The nymphal development consisted of four instars on all the three hosts. The total nymphal period highest on chrysanthemum (4-9 days with an average of 6.40±1.25 days), followed by marigold (4-8 days with an average of 6.04±1.24 days) and lowest on zinnia (4-8 days with an average of 5.60±1.35 days). The pre reproductive period was 1.36±0.48, 1.28±0.45, 1.24±0.43 on chrysanthemum, marigold and zinnia, respectively. Reproductive period was 4.80±1.80 on chrysanthemum, 4.68±1.62 on marigold and 4.28±1.33 on zinnia. The average of post-reproductive period ranged from 1 to 2 days, with 1.32±0.47, 1.28±0.45 and 1.20±0.40 days for aphids reared on chrysanthemum, marigold and zinnia, respectively. The longevity was (3-14 days; 6.88±2.31 days) on chrysanthemum, (3-10 days; 6.60±1.97 days) on marigold and (3-9 days; 6.28±1.86 days) on zinnia. Fecundity ranged from 8-32 nymphs, 8-26 nymphs, 4-22 nymphs on chrysanthemum, marigold and zinnia, respectively. Overall, chrysanthemum served as the most preferred host for *M. sanbornii* when compared to marigold and zinnia, as reflected by its relatively higher reproductive potential and favourable biological parameters.

Keywords : Aphid, *Macrosiphoniella sanbornii*, Chrysanthemum and biology.

Introduction

Chrysanthemum (*Dendranthema grandiflora* Borkh) derives its nomenclature from the Greek words “chrysos-golden” and “anthos -flower” and is taxonomically classified under the family Asteraceae. It is known as the “Queen of the East” and blooms mainly during November-December and is also called the autumn queen. Globally, it is the second most important floricultural crop after rose and ranks third in international cut flower trade after carnation and rose. It is the national flower of Japan and owing to its importance, 1995-96 was celebrated as the “International Year of Chrysanthemum” (Saicharan *et al.*, 2017). Chrysanthemum is a photoperiod-sensitive crop that requires long days for vegetative growth and short days for floral initiation (Brahma, 2002). According to indiastat during the year, 2025-26 the area

of chrysanthemum is 39.44 thousand hectares with the production of 930.85 MT loose flowers and 42.77 MT cut flowers. Flowers are now commercially cultivated in several states with highest share in Karnataka followed by Tamil Nadu, Madhya Pradesh, West Bengal, Telangana, Gujarat, Himachal Pradesh, Chhattisgarh and Meghalaya (Anonymous, 2026a). Area of chrysanthemum in Gujarat is one thousand hectares with a production of 7.61 MT loose flowers during the year, 2025-26. Highest area, production and productivity are recorded in middle Gujarat followed by south and north Gujarat regions. Kheda, Dahod, Panchmahal, Navsari, Anand and Ahmedabad are major chrysanthemum growing districts of Gujarat (Anonymous, 2026b). The productivity and marketability of chrysanthemum are decreasing considerably due to insect-pests damage (Sreedhar *et*

al., 2020). Chrysanthemum production is challenged by different species of aphids among them, *M. sanbornii* also known as “blackflies” is a wide spread pest on cultivated chrysanthemum throughout the world. It is a holocyclic species with East Asian origin (Heie, 1993). It feeds mainly on young leaves and developing flower buds and could become very abundant on them. It impairs phloem sugar unloading in chrysanthemum, reducing soluble sugars by 19%. High infestation results in deformation and distorted growth and also transmits Chrysanthemum virus B (CVB) non-persistently, with mottling incidence reaching 63% (Agrios, 2024). Thus, it is posing a threat to chrysanthemum flower production under Gujarat conditions. To develop a management strategy for any pest, one should have knowledge regarding its biology and number of generations during a season. Keeping these facts in view, the present investigation was conducted at the laboratory of the Department of Plant Protection, College of Horticulture, Anand Agricultural University, Anand, Gujarat.

Materials and Methods

The biology of aphid, *M. sanbornii* was carried out on three different host plants (Chrysanthemum, marigold and Zinnia) under the laboratory conditions from December, 2025 to January, 2026. The average minimum (13 °C) and maximum temperature (30 °C) and relative humidity (60%) were recorded during the study period. The change of instars was determined based on the presence of exuviae of nymphs. The growth of nymphs, moulting, passing into subsequent instars and the number of nymphs produced per female were observed at 12-hour intervals. Such that different morphological characters were recorded from the observations. The aphids were reared on five potted chrysanthemum plants, each individually covered with a glass chimney (14×5 ×7 cm). The top end of the chimney was covered with muslin cloth and the culture was maintained. The newly produced nymphs were transferred individually into each Petri dishes (9 cm diameter and 2 cm height) containing blotting paper with the help of fine moist hair brush. Leaves of chrysanthemum, marigold and zinnia were provided separately as food. Food was replaced daily in the morning. A total of 25 sets for each of the three host plants were prepared for the study (Figure-1). Observations were recorded daily with the help of a magnifying lens and a stereo microscope.

Results and Discussions

The results on the biology of aphid, *M. sanbornii* on three different host plants are presented hereunder:

Nymphs

The aphids passed through four nymphal instars in all the three hosts in order to attain the adult stage (Figure-2). Likewise, aphids reared on three different hosts were examined by using binocular microscope and duration of instars and total nymphal period were recorded. Kakar and Sood (1989) as well as Duan and Zhang (2004) reported that the occurrence of four nymphal instars in *M. sanbornii* infesting chrysanthemum.

First instar

The first instar nymph was dull brick red in colour with a soft body. It is wingless with relatively long legs and antennae. The nymph was oval in shape, having cornicles which are short and not well developed. The duration of first instar nymph was ranged between 1 to 2 days with an average of 1.48 ± 0.51 , 1.32 ± 0.48 , 1.24 ± 0.44 , in chrysanthemum, marigold and zinnia, respectively (Table 1). Surani and Shukla (2022) reported that the duration ranged from 1 to 2 days with an average of 1.83 ± 0.38 days and also Vaishnavi (2022) recorded that the average duration was 1.78 ± 0.27 in chrysanthemum.

Second instar

The second instar was similar to the first instar nymph except in size and the body colour which is comparatively darker. The nymph has short sized cornicles with long legs and antenna. It was completed in 1-2 days and the average was 1.52 ± 0.51 days in chrysanthemum as host. The average duration, when it fed with marigold and zinnia was 1.48 ± 0.51 , 1.32 ± 0.48 , respectively (Table 1). Surani and Shukla (2022) and Vaishnavi (2022) reported that the duration was varied from 1 to 2 days with an average of 1.47 ± 0.51 days and 1.59 ± 0.30 days in chrysanthemum, respectively. The duration of the second instar nymph was 2.25 days in chrysanthemum (Kakar and Sood, 1989).

Third instar

The third instar is darker in color with developed cornicles whereas, the legs were light to brownish-black in color. Antenna is longer than its body length. The duration is ranged from 1 to 2 days in all three hosts but an average is 1.60 ± 0.50 , 1.48 ± 0.51 and 1.40 ± 0.50 in chrysanthemum, marigold and zinnia, respectively (Table 1). Surani and Shukla (2022) reported that the average was 1.50 ± 0.51 days. Vaishnavi (2022) reported that the average duration was 1.70 ± 0.31 days in chrysanthemum.

Fourth instar

The body colour was dark brick red and cornicles were dark black in colour. The antenna was even longer than the body and increased in size and shape compared to rest of nymphal instars. The duration was varied from 1 to 3 days with an average of 1.84 ± 0.75 days, in chrysanthemum. While, duration were ranged from 1-2 days with an average of 1.64 ± 0.49 and

1.60 ± 0.50 , in marigold and zinnia. The duration of the fourth instar was longest in comparison with other instars in all the hosts (Table 1). Kakar and Sood (1989) reported the duration of the fourth instar of aphid recorded 3.05 days, in the chrysanthemum. Surani and Shukla (2022) who reported that an average duration was 1.53 ± 0.63 days in chrysanthemum.

Table 1: Duration of different stages of aphid, *M. Sanbornii* on different host plants under laboratory condition

Life Stages	Hosts								
	Chrysanthemum			Marigold			Zinnia		
	Duration in day(s)								
	Min.	Max.	Mean $\pm$ S. D.	Min.	Max.	Mean $\pm$ S. D.	Min.	Max.	Mean $\pm$ S. D.
Nymph									
I instar	1.0	2.0	1.48 $\pm$ 0.51	1.0	2.0	1.32 $\pm$ 0.48	1.0	2.0	1.24 $\pm$ 0.44
II instar	1.0	2.0	1.52 $\pm$ 0.51	1.0	2.0	1.48 $\pm$ 0.51	1.0	2.0	1.32 $\pm$ 0.48
III instar	1.0	2.0	1.60 $\pm$ 0.50	1.0	2.0	1.48 $\pm$ 0.51	1.0	2.0	1.40 $\pm$ 0.50
IV instar	1.0	3.0	1.84 $\pm$ 0.75	1.0	2.0	1.64 $\pm$ 0.49	1.0	2.0	1.60 $\pm$ 0.50
Total nymphal period	5.0	9.0	6.44 $\pm$ 1.23	4.0	8.0	5.92 $\pm$ 1.15	4.0	8.0	5.56 $\pm$ 1.33
Adult									
Pre-reproduction period	1.0	2.0	1.36 $\pm$ 0.49	1.0	2.0	1.28 $\pm$ 0.46	1.0	2.0	1.24 $\pm$ 0.44
Reproduction period	2.0	8.0	4.80 $\pm$ 1.80	2.0	7.0	4.68 $\pm$ 1.63	2.0	6.0	4.28 $\pm$ 1.34
Post-reproduction period	1.0	2.0	1.32 $\pm$ 0.48	1.0	2.0	1.28 $\pm$ 0.46	1.0	2.0	1.20 $\pm$ 0.41
Longevity	4.0	11.0	7.48 $\pm$ 2.12	4.0	10.0	7.24 $\pm$ 1.81	4.0	10.0	6.72 $\pm$ 1.59
Fecundity (No. of nymph/female)	8.0	36.0	19.68 $\pm$ 7.43	8.0	32.0	17.88 $\pm$ 5.78	4.0	24.0	15.72 $\pm$ 4.60
Total life span	10.0	19.0	13.92 $\pm$ 2.58	9.0	18.0	13.16 $\pm$ 2.30	8.0	17.0	12.28 $\pm$ 2.26

Note: S.D. = Standard deviation

Total nymphal period

The total nymphal period observed in aphid reared on chrysanthemum was ranged from 5 to 9 days and an average was 6.44 ± 1.23 and it was 4 to 8 days with an average of 5.92 ± 1.15 on marigold. The nymphal period was observed less on aphids reared on leaves of zinnia ranged from 4 to 8 days with an average of 5.56 ± 1.33 (Table 1). Surani and Shukla (2022) found that the range of nymphal period was 4 to 9 days with an average of 6.33 ± 1.18 days.

Adult

The adult was closely resembled the fourth instar nymph, differing mainly in body size. The apterous viviparous females were glossy and are dark reddish-brown to nearly black in colour, lacking waxy coating. They possessed black, comparatively short and thick siphunculi. The antennae were brown, with most of the third antennal segment appearing paler except at the distal end (Figure-3a). It reproduces primarily through parthenogenesis, producing live nymphs without mating. In winged forms, the wings were fully developed. The alate viviparous females exhibited a similar coloration, being shiny dark reddish-brown to black, with lighter basal portions of the third antennal

segment, as well as paler proximal regions of the femora and mid-body areas (Figure-3b). The longevity of adult apterous females varied across host plants, ranging from 4 to 11 days on chrysanthemum with a mean of 7.48 ± 2.12 days. The duration was ranged from 4 to 10 days with an average of 7.24 ± 1.81 , 6.72 ± 1.59 days in marigold and zinnia, respectively (Table 1). Haghani *et al.* (2003) reported an adult longevity was 7.28 days on the aphid in chrysanthemum. Similarly, Surani and Shukla (2022) reported an adult lifespan of 4 to 12 days with an average of 6.73 ± 2 days in chrysanthemum.

Pre-reproduction, reproduction and post-reproduction period

The pre reproductive period ranged from 1 to 2 days with an average of 1.36 ± 0.49 , 1.28 ± 0.46 , 1.24 ± 0.44 in aphids reared on chrysanthemum, marigold and Zinnia, respectively (Table 1). Surani and Shukla (2022) reported that the average pre-reproductive period was 1.20 ± 0.41 days which is ranged between 1 to 2 days. Vaishnavi (2022) observed that it was ranged from 1 to 3 days with an average of 1.70 ± 0.69 on chrysanthemum. Reproductive period was varied from 2 to 8 days with an average of 4.80 ± 1.80 on the host of chrysanthemum. The

reproductive period of aphid reared on marigold was 2 to 7 days and an average was 4.68 ± 1.63 . Whereas, on zinnia it was 2 to 6 days with an average of 4.28 ± 1.34 (Table 1). Surani and Shukla (2022) reported the duration was ranged from 2 to 8 days with an average of 4.37 ± 1.87 days in chrysanthemum. While, Yassin (2020) reported the reproductive period of *M. sanbornii* reared on chrysanthemum was 6.73 days. The post-reproductive period was observed from 1 to 2 days, with mean durations of 1.32 ± 0.48 , 1.28 ± 0.46 and 1.20 ± 0.41 days for aphids reared on chrysanthemum, marigold and zinnia, respectively (Table 1). Surani and Shukla (2022) reported that the days varied from 1 to 2 days with an average of 1.17 ± 0.38 days and Vaishnavi (2022) observed that the average was 1.53 ± 0.36 days.

Fecundity

The reproductive potential of the aphid on chrysanthemum ranged from 8 to 36 nymphs, with a mean of 19.68 ± 7.43 . On marigold, it varied from 8 to 32 nymphs, with an average of 17.88 ± 5.78 , while on zinnia it ranged from 4 to 24 nymphs, with a mean of 15.72 ± 4.60 (Table 1). Surani and Shukla (2022) reported fecundity was ranged from 2 to 36 nymphs, with an average of 14 ± 8.68 nymphs per female. Haghani *et al.* (2003⁶) on chrysanthemum aphid, *M. sanbornii* indicated that fecundity was 29.3 nymphs per female at 24 °C and 35% RH, 31.22 nymphs at 28 °C and 35% RH and 31.5 nymphs at 28 °C and 65% RH. These observations are broadly comparable with the present results, further supporting the variability in reproductive potential under different environmental

conditions. However, the present observations are only partially supported by the earlier work of Kakar and Sood (1989), who recorded a much higher fecundity of 61 nymphs per female, indicating a considerable variation from the current findings. Zamani *et al.* (2003¹⁵) reported that the maximum nymphal production of the chrysanthemum aphid reached 41 nymphs per female.

Total life cycle

The total life span of the aphid ranged from 9 to 23 days, with a mean of 13.52 ± 2.55 days on chrysanthemum and 9 to 16 days, with a mean of 13.08 ± 2.19 days and 12.68 ± 2.11 days on marigold and zinnia, respectively. Shaheen *et al.* (2007) reported that the mean developmental period of the rose aphid, *Macrosiphum rosae*, was 11.6 days in spring and 13.4 days in autumn. Surani and Shukla (2022) recorded that the life span was ranged from 9 to 20 days with a mean of 13.07 ± 2.18 days, closely corresponding to the mean life span recorded on marigold in the present study. Similarly, Vaishnavi (2022) reported a life span ranged from 7 to 23 days with a mean of 17.43 ± 3.47 days, which also falls within the range of the present observations.

Conclusion

Chrysanthemum serves as the most preferred host for *M. sanbornii* followed by marigold and zinnia which was reflected by its relatively higher reproductive potential and favourable biological parameters.

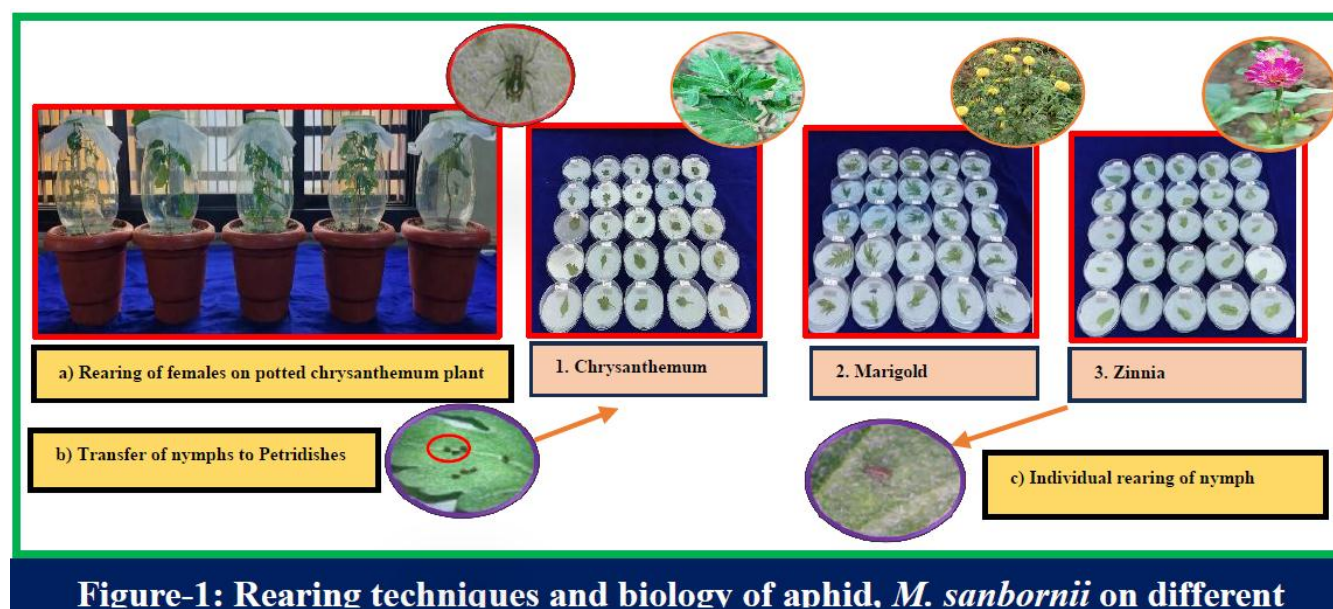


Figure-1: Rearing techniques and biology of aphid, *M. sanbornii* on different

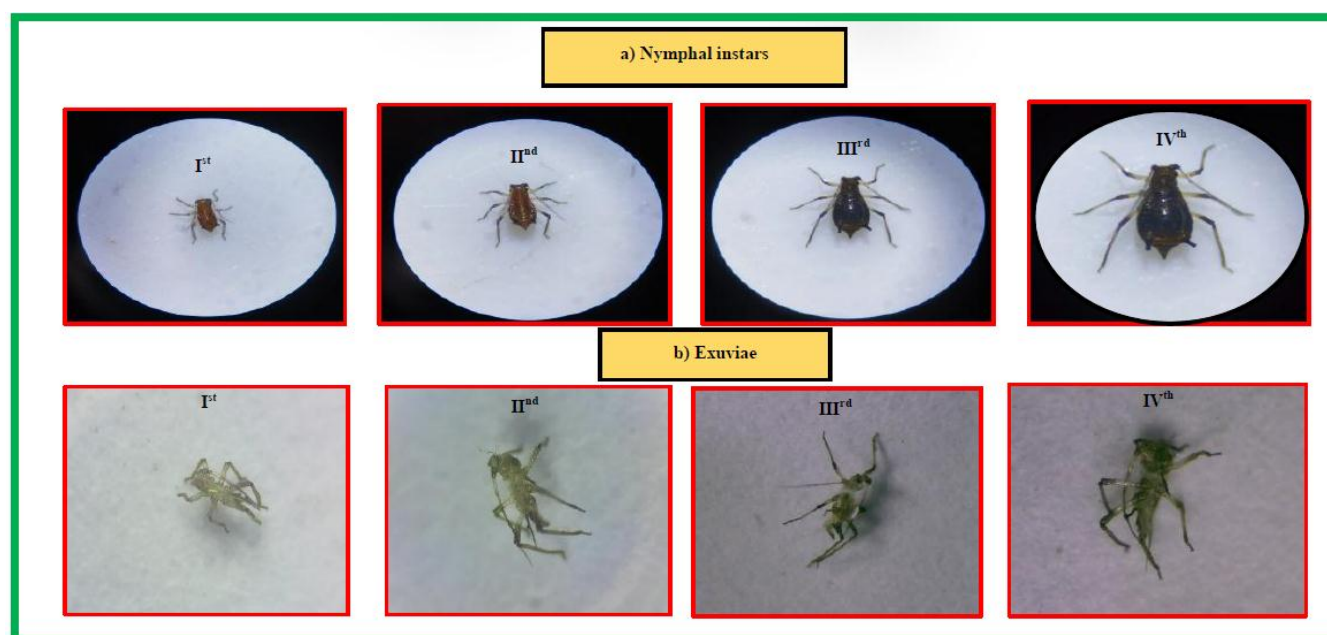


Figure-2: Different nymphal instars of aphid, *M. sanbornii*

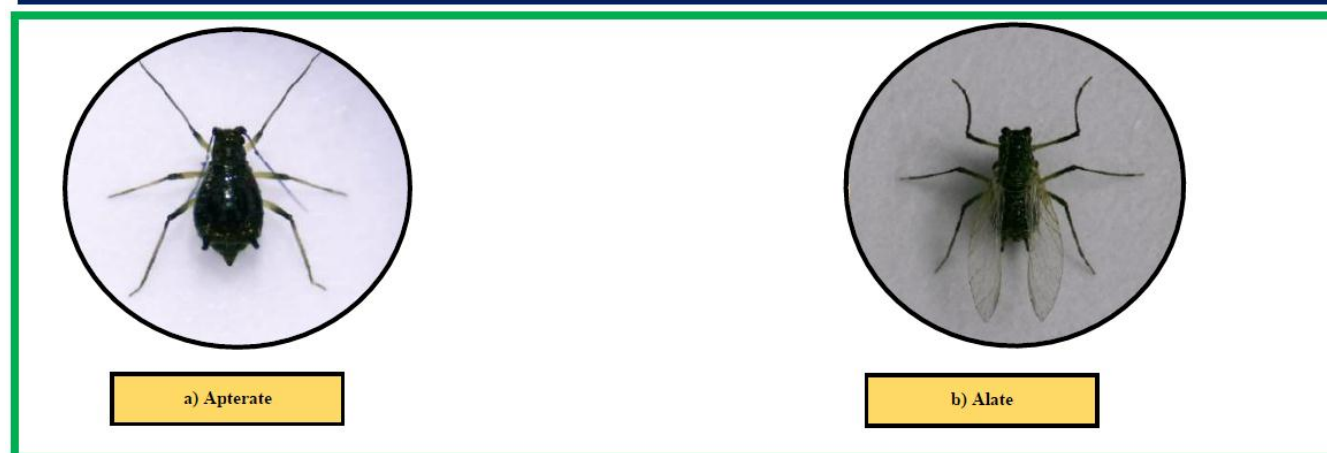


Figure-3: Adults of aphid, *M. sanbornii*

Acknowledgment

The authors express their sincere gratitude to taxonomist Dr. Sunil Joshi, Principal Scientist and Head of the Division of Germplasm Collection and Characterization at ICAR - National Bureau of Agricultural Insect Resources, for confirming the identity of the aphid species infesting Chrysanthemum at Anand Agricultural University as *Macrosiphoniella sanbornii* (Gillette).

References

- Agrios, G. N. (2024). *Plant pathology*. Elsevier Academic Press.
- Anonymous. (2026). *Area and production of chrysanthemum in India (2025–2026: 1st advance estimates)*. Indiastat. Retrieved on April 16, 2026, from <https://www.indiastat.com/data/agriculture>
- Anonymous. (2026). *Area and production of chrysanthemum in Gujarat (2025–2026: 1st advance estimates)*. Indiastat. Retrieved on April 16, 2026, from <https://www.indiastat.com/data/agriculture>
- Brahma, B. (2002). Chrysanthemum when and how to grow. *Floriculture Today*, **41** (1), 30-32.
- Duan, J., & Zhang, R. (2004). Effect of temperature on *Macrosiphoniella sanbornii* development. *The Journal of Applied Ecology*, **15**(6), 1035-1038.
- Haghani, M., Kamali, K., Rashed Mohassel, A., Fathipour, Y., Talebi, A. A., & Zamani, A. A. (2003, August). The effect of greenhouse thermal and humidity changes on population growth of *Macrosiphoniella sanbornii* (Homoptera: Aphididae). In *Proceedings of the Applied-Scientific Seminar on Flowers and Ornamental Plants* (Iran). <https://agris.fao.org/search/en/providers/122649/records/647247f853aa8c896304bd5f>
- Heie, O.E. (1993). *The Aphidoidea (Hemiptera) of Fennoscandia and Denmark* (Vol. 5). E. J. Brill.

- Kakar, K. L., & Sood, A. K. (1989). Bioecological studies and control of rose aphid, *Macrosiphum rosaeiformis* (D.). *Journal of Aphidiology*, **3**(2), 113-118.
- Saicharan, M., Anitha, V., Kameshwari, L., & Srilatha, D. (2017). Seasonal incidence of insect pests of chrysanthemum in Maddur and Palgutta villages of Ranga Reddy district, Telangana. *International Journal of Farm Sciences*, **7**(4), 141-143.
- Shaheen, G. S. G., & Zaz, G. M. (2007). Biology of rose aphid *Macrosiphum rosae* L. (Homoptera: Aphididae) in Kashmir. *Applied Biological Research*, **9**(1-2), 50-53.
- Sreedhar, M., Vasudha, A., & Khudus, S. (2020). Insect-pests complex studies on chrysanthemum in Pantnagar region. *Journal of Entomology and Zoology Studies*, **8**(2), 1644-1646.
- Surani, P. M., & Shukla, A. (2022). Biological attributes of chrysanthemum aphid, *Macrosiphoniella sanbornii* G. *Journal of Experimental Zoology India*, **25**(1), 51-54.
- Vaishnavi, H. S. (2022). *Biology, population dynamics and eco-friendly management of aphid, Macrosiphoniella sanbornii on chrysanthemum* (Master's thesis, Sardarkrushinagar Dantiwada Agricultural University). Krishikosh. Retrieved on March 29, 2026, from <https://krishikosh.egranth.ac.in/handle/1/5810188954>
- Yassin, S. (2020). Biological studies and estimation life table parameters of chrysanthemum aphid, *Macrosiphoniella sanbornii* under different temperature conditions. *Egyptian Academic Journal of Biological Sciences, A, Entomology*, **13**(1), 9-16.
- Zamani, A. A., Kamali, K., Rashed, M. A., Fathipour, Y., Moharrampour, S., Talebi, A. A., et al. (2003). Biology of chrysanthemum aphid, *Macrosiphoniella sanbornii* Gillette (Homoptera: Aphididae) in natural conditions. In *Proceedings of the Applied-Scientific Seminar on Flowers and Ornamental Plants* (Iran). <https://www.fao.org/>