

New Distribution Records of *Aphis nasturtii* (Hemiptera: Aphididae) in Japan

Shuhei ADACHI^{1,2)*}, Yoshiyuki MATSUMOTO³⁾, Hiroyuki YOSHITOMI⁴⁾,

Daisuke SASAKI⁵⁾, Makoto TOKUDA^{1,2)}

¹⁾The United Graduate School of Agricultural Sciences, Kagoshima University,
Korimoto 1-21-24, Kagoshima, 890-0065 Japan.

²⁾Laboratory of Systems Ecology, Faculty of Agriculture, Saga University, Honjo 1,
Saga, 840-8502 Japan. E-mail: tokudam@cc.saga-u.ac.jp

³⁾Shibaura Institute of Technology Kashiwa Junior and Senior High School, Masuo 700,
Kashiwa, 277-0033 Japan. E-mail: yoshi.ma@fancy.ocn.ne.jp

⁴⁾Entomological Laboratory, Faculty of Agriculture, Ehime University, Tarumi 3-5-7,
Matsuyama, 790-8566 Japan. E-mail: hymushi@agr.ehime-u.ac.jp

⁵⁾Shizuoka Plant Protection Office, Tomioka 678-1, Iwata, 438-0803 Japan. E-mail: sasakiwr30m@gmail.com

*Corresponding author. Email: aphidtennis@gmail.com

Abstract *Aphis nasturtii* is a polyphagous aphid and widely distributed throughout the world with the exception of the Australian Continent. In Japan, *A. nasturtii* was recorded only from Okinawa Island, the Ryukyu Islands and Tokyo, central Honshu. In this paper, we report *A. nasturtii* from Shizuoka, Shimane, Ehime, and Saga Prefectures. This is the first report from Shikoku and Kyushu, Japan. In addition, we propose a Japanese name for *A. nasturtii* as “Orandagarashi-aburamushi” and discuss its pest status in Japan.

Introduction

The family Aphididae (Hemiptera), consisting of approximately 5100 species worldwide and 750 species in Japan, includes various pest species of agricultural crops (Ishikawa, 2000; Miyazaki *et al.*, 2016; Favret & Eades, 2017). In addition to their direct feeding damages, many species also act as vectors of plant viruses (Moritsu, 1983; Adachi, 2017).

Aphis nasturtii Kaltenbach, 1843 (Aphididae: Aphidinae: Aphidini) is a polyphagous species distributed worldwide with the exception of the Australian Continent (Mifsud *et al.*, 2011). This species is associated with useful plants including eggplant *Solanum tuberosum* (Solanaceae) and *Nasturtium officinale* (Brassicaceae) (Blackman & Eastop, 2017) and is known as one of the major vectors of potato virus Y (PVY) (Blackman & Eastop, 2000). Therefore, the presence of this

species may cause damages to agricultural crops.

Although Blackman & Eastop (2000) reported the distribution of *A. nasturtii* from Japan, detailed information was not provided. In recent years, some studies have recorded *A. nasturtii* from Okinawa Island, the Ryukyu Islands (Tanaka *et al.*, 2011) and Tokyo, central Honshu (Kimura & Tsuda 2017), but the distributional information remains fragmented in Japan.

During the course of faunistic studies of aphids (Adachi & Yoshitomi, 2012, 2013; Yoshitomi & Adachi, 2013), we noticed that *A. nasturtii* occurs in various localities in Honshu, Shikoku, and Kyushu, Japan. In this paper, we provide our collection records of *A. nasturtii* and its host-plant species. In addition, we propose a Japanese name for this species and discuss its pest status in Japan.

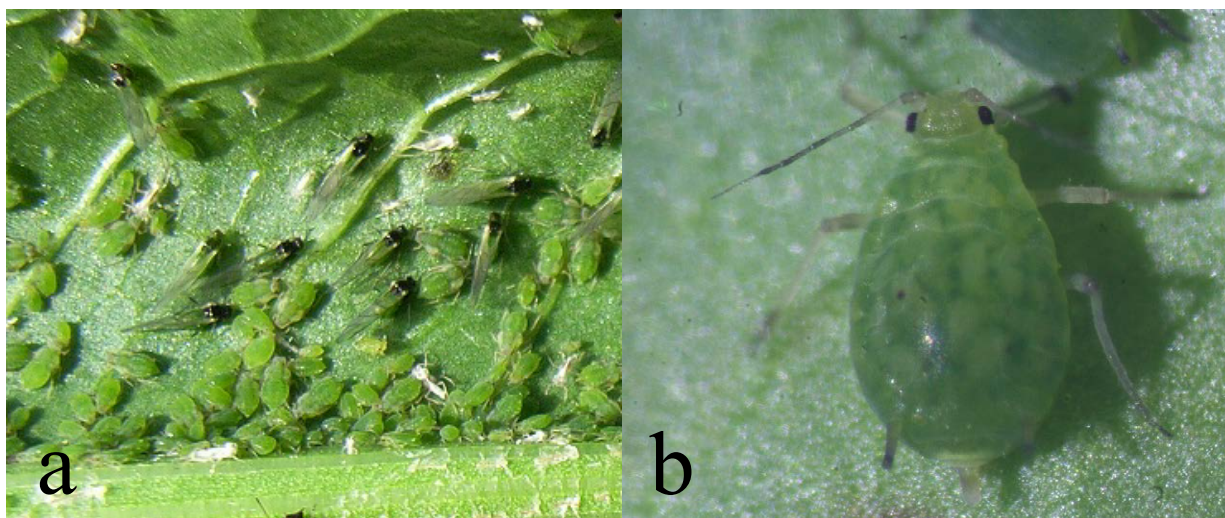


Fig. 1. *Aphis nasturtii*, a colony (a) and an apterous viviparous female (b).

Materials and methods

Aphid colonies were surveyed in Shizuoka Prefecture, central Honshu in 2017, Shimane Prefecture, western Honshu in 2012, in Ehime Prefecture, Shikoku from 2011 to 2014, and Saga Prefecture, Kyushu from 2014 to 2017. During the aphid survey, host-plant species and feeding sites were recorded. In all cases, aphids were collected and preserved in 75% ethanol, and mounted on slides in Canada balsam using the technique outlined in Martin (1983). Then these specimens were identified following Stroyan (1984).

Each confirmation record shown in our results consists of the number of specimens, locality, collection date and collector. In addition, host-plant species and feeding sites, as well as sample numbers (if any), are indicated in parentheses after the collection dates. The respective confirmation data are separated by semicolons.

Specimens collected from Shizuoka Prefecture are stored in Museum of Natural and Environmental History, Shizuoka, Japan, those from Shimane Prefecture and Ehime Prefecture are in Ehime University Museum, Matsuyama, Japan, and those from Saga Prefecture are in the Laboratory of Systems Ecology, Faculty of Agriculture, Saga University, Japan.

Results

Among aphids surveyed in this study, the following specimens were identified as *A. nasturtii*.

[HONSHU] <Shizuoka Pref.> 20 apterous viviparous females, Niihashi, Gotenba City, 12. v. 2017 (*Rumex* sp., stem and lower leaf surface, sample number: 00003072-00003091), Daisuke Sasaki. <Shimane Pref.> 6 apterous viviparous females, Nakaaraki, Taisha-cho, Izumo City, 31. v. 2012 (*Rumex* sp., stem, sample number: A511), Hiroyuki Yoshitomi (Fig. 1b).

[SHIKOKU] <Ehime Pref.> 9 apterous viviparous females, Ishite, Matsuyama City, 2. iv. 2011 (*Rumex acetosa*, lower leaf surface, sample number: A19), Hiroyuki Yoshitomi (Fig. 1a); 1 alate and 4 apterous viviparous females, Tarumi, Matsuyama City, 5. iv. 2011 (*Veronica undulata*, current shoot, sample number: A23), Hiroyuki Yoshitomi; 3 apterous viviparous females, Sugezawa-machi, Matsuyama City, 10. vi. 2014 (*Rumex japonicus*, lower leaf surface, sample number: A1044), Hiroyuki Yoshitomi.

[KYUSHU] <Saga Pref.> 5 alate and 9 apterous viviparous females, Wakamiya, Saga City, 30. iv. 2014 (*Rumex japonicus*, lower leaf surface and stem), Shuhei Adachi; 3 alate viviparous females, Cho-kanda, Mikatsuki-cho, Ogi City, 14. v. 2015 (*Rorippa palustris*, upper stem), Shuhei Adachi; 1 alate viviparous female, Nanri, Kawasoe-machi, Saga City, 15. iii. 2016 (*Cardamine scutata*, peduncle), Shuhei Adachi; 5 apterous viviparous females, Cho-kanda, Mikatsuki-cho, Ogi City, 17. iv. 2016 (*Rorippa indica*, upper stem), Shuhei Adachi; 1 alate viviparous female, Nanri, Kawasoe-machi, Saga City, 18. iv. 2016 (*Rorippa indica*, current shoot), Shuhei Adachi; 1 alate viviparous female, Cho-kanda, Mikatsuki-cho, Ogi City, 7. iv. 2017 (*Rorippa indica*, current shoot), Shuhei Adachi.

Discussion

In the present study, *A. nasturtii* was reported for the first time from Shizuoka, Shimane, Ehime, and Saga Prefectures, located between Okinawa Island and Tokyo where the aphid had been already reported by Tanaka *et al.* (2011) and Kimura & Tsuda (2017). These results suggest that *A. nasturtii* is widely distributed in Japan. In addition, this is the first report from Shikoku and Kyushu, Japan.

This species has been recently recognized to occur in Japan (Blackman & Eastop, 2000; Tanaka *et al.*, 2011; Kimura & Tsuda, 2017), so it might be an introduced species. However, we have no information about the establishment period and previous distributional ranges of *A. nasturtii* in Japan. Future molecular biological studies will be needed to clarify the origin of Japanese *A. nasturtii* populations.

As mentioned earlier, *A. nasturtii* is a polyphagous species feeding on some useful plants and a vector of PVY (Blackman & Eastop, 2000, 2017). In this study, colonies of *A. nasturtii* were found only on wild Brassicaceae and Polygonaceae, even though we investigated aphids on some crops in several fields around the colonies. Besides, as far as we know, this species has never been reported as a pest of crops in Japan. These facts suggest that *A. nasturtii* may not be of economic importance at present in Japan.

Shinji (1939) reported *Aphis mizutakarashi* Shinji on *Cardamine lyrata* (Brassicaceae) from Japan. The morphology and body color of *A. mizutakarashi* are very similar to those of *A. nasturtii*. Therefore, it might be useful to undertake more detailed comparisons between these species in the future to confirm their taxonomic status.

Finally, we propose a Japanese name for *A. nasturtii* as “Orandagarashi-aburamushi”, because this species name is associated with the plant genus *Nasturtium*, which is called “Orandagarashi” in Japanese.

Acknowledgments

We thank Mr. Shun'ichiro Sugimoto (Moji Plant Protection Station, Moji, Japan) for his valuable comments on an early draft and Dr. Lisa Filippi (Hofstra University, New York, USA) for brushing up our English usage. We are indebted to Dr. Toshio Kishimoto (Museum of Natural and Environmental History, Shizuoka, Japan) for storage of the specimens collected from Shizuoka Prefecture.

References

- Adachi, S., 2017. [Important plant virus diseases transmitted by aphids.] *Gendai-Nougyo*, **96**(6): 82–85. (In Japanese.)
- Adachi, S. and H. Yoshitomi, 2012. Aphids of Ehime Prefecture, Shikoku, Japan (Hemiptera, Aphididae). *Bulletin of Ehime Prefectural Science Museum*, **17**: 29–47. (In Japanese with English summary.)
- Adachi, S. and H. Yoshitomi, 2013. Aphids of Ehime Prefecture, Shikoku, Japan (Hemiptera, Aphididae) II. *Bulletin of Omogo Mountain Museum*, **5**: 11–22. (In Japanese.)
- Favret, C. and D. C. Eades, 2017. Aphid Species File. <http://Aphid.SpeciesFile.org> (Accessed on 1 November 2017.)
- Blackman, R. L. and V. F. Eastop, 2000. Aphids on the world's crops. Second Edition. John Wiley & Sons, LTD.

- Blackman, R. L. and V. F. Eastop, 2017. Aphids on the world's plants. <http://www.aphidsonworldsplants.info/> (Accessed on 27 July 2017.)
- Ishikawa, H., 2000. Biology of aphids. University of Tokyo Press, Tokyo. (In Japanese.)
- Kimura, K. and S. Tsuda, 2017. Surveys of viruliferous alate aphids of *Plum pox virus*. *Plant Protection*, **71**: 35–39. (In Japanese.)
- Mifsud, D., M. Mangion, E. Azzopard, X. Espadaler, D. Cuesta-Segura, G. W. Watson and N. P. Hidalgo, 2011. Aphids associated with shrubs, herbaceous plants and crops in the Maltese Archipelago (Hemiptera, Aphidoidea). *Bulletin of the Entomological Society of Malta*, **4**: 5–53.
- Miyazaki, M., S. Aoki, and M. Sano, 2016. Family Aphididae. pp. 96–173. In: Editorial Committee of Catalogue of the Insects of Japan (Eds.), Catalogue of the insects of Japan. Vol. 4. Paraneoptera. Touka-shobo, Fukuoka. (In Japanese.)
- Martin, J. H., 1983. The identification of common aphid pests of tropical agriculture. *International Journal of Pest Management*, **29**: 395–411.
- Moritsu, M., 1983. Aphids of Japan in color. Zenkoku-Noson-Kyoiku-Kyokai, Tokyo. (In Japanese.)
- Shinji, O., 1939. A List of Japanese Aphidini with the description of four new species. *Zoological Magazine (Dobutsugaku Zasshi)*, **51**: 432–439.
- Stroyan, H. L. G., 1984. Aphids-Pterocommatinae and Aphidinae (Aphidini). Handbooks for the identification of British insects 2, 6. 232 pp. Royal Entomological Society of London, London.
- Tanaka, H., H. Ohnishi, H. Tatsuta and K. Tsuji, 2011. An analysis of mutualistic interactions between exotic ants and honeydew producers in the Yanbaru district of Okinawa Island, Japan. *Ecological Research*, **26**: 931–941.
- Yoshitomi, H. and S. Adachi, 2013. Aphidoidea of Shimane Prefecture. *Bulletin of the Hoshizaki Green Foundation*, **16**: 219–240. (In Japanese with English summary.)

[Received: October 5, 2017; accepted: November 7, 2017]