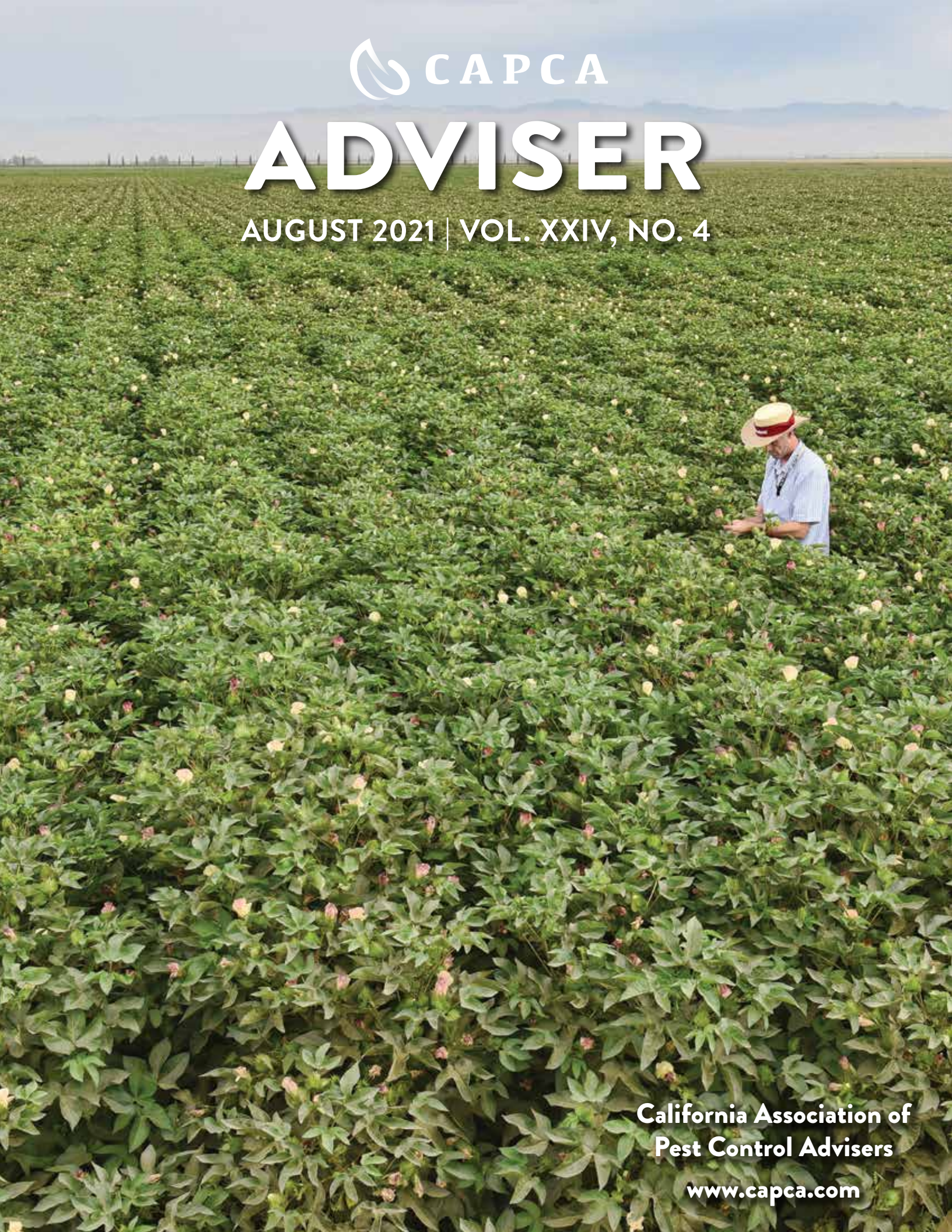

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Current state of hemp pest management in California

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Introduction

Hemp, *Cannabis sativa* L. containing <0.3% delta-9 tetrahydrocannabinol (THC), is a new crop to modern agriculture, legalized for research in the 2014 Farm Bill and federally legalized for commercial production in the 2018 Farm Bill. While a new crop presents an opportunity for profit and farm diversification, it also comes with a unique set of challenges. From the 1950s until 2014, hemp was prohibited for research and cultivation, thus, very little information is currently available regarding modern pest management strategies. In the current era, hemp is primarily cultivated for cannabinoids, which makes this a vastly different crop and production system than that of the traditional fiber hemp, which was historically grown.

Challenges to effective pest management

Unlike most cropping systems such as corn, soybeans, vegetables, etc., very little archived research information is available to aid current hemp pest management efforts. Previous hemp production focused on crops grown for fiber and arthropod pests were not considered a major hindrance to production. Anyone currently involved with hemp cultivation is rapidly playing catch-up and making use of any relevant pest management information to assist with pest issues. Although pest phenology may differ depending on the crop, management and biology information regarding generalist pests (e.g. corn earworm, twospotted spider mite) in other crops is a helpful starting point for management in hemp. On the contrary, hemp-specific arthropods (e.g. cannabis aphid, hemp russet mite) feed and reproduce exclusively on hemp; since there has been no opportunity to conduct research with hemp until recently, very little is known about the biology and life history of these unique organisms.

Key pests

Many insects and mites can be observed in hemp and the pest complex can differ depending on whether the crop is cultivated indoors or outdoors. Some of the most often-seen pests include corn earworm, twospotted spider mite, cannabis aphid, and hemp russet mite.

FIG. 1

Fig. 1: *Corn earworm in rotted hemp material*

Fig. 2: *Twospotted spider mite on hemp leaf*

FIG. 2

Photos: Kadie Britt

- **Corn earworm** (Lepidoptera: Noctuidae, *Helicoverpa zea*, **Figure 1**) is a generalist insect pest that can be found in hemp grown outdoors. Larvae have chewing mouthparts and can cause considerable damage to buds or inflorescences. Feeding wounds may allow entry of pathogens that facilitate the presence of bud sections that appear dark and rotted, also known as bud rot. Bud rot can compromise the quality and marketability of harvested hemp.

- **Twospotted spider mite** (Trombidiformes: Tetranychidae, *Tetranychus urticae*, **Figure 2**) is a generalist mite pest that can be found indoors and outdoors. Feeding injury causes stippling marks on leaves and webbing can sometimes be observed in apical portions of plants.

- **Cannabis aphid** (Hempitera: Aphididae, *Phorodon cannabis*, **Figure 3**) is a cannabis-specific aphid that can be found in indoor and outdoor hemp. Aphids suck fluids and nutrients from plant phloem with piercing-sucking mouthparts. As cannabis aphid feeds from and moves throughout the hemp plant, a sticky substance, known as honeydew, is excreted. Honeydew forms a sticky coating on the surface of leaves and buds and can ultimately lead to sooty mold development. As aphids grow and molt, they shed exoskeletons which can get caught in honeydew.

Fig. 3: *Cannabis aphid on underside of hemp leaf*

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- **Hemp russet mite** (Trombidiformes: Eriophyidae, *Aculops cannabicola*, **Figure 4**) is a microscopic, cannabis-specific mite that can be found in indoor and outdoor hemp. This mite cannot be seen without the use of microscopy and symptoms are not always visible if only low populations are present. Hemp russet mite feeds by piercing the surface of plant cells and feeding on fluid. Feeding can lead to dull or gray leaves and *sometimes* upward curling of leaves can be observed (depending on hemp cultivar).

A good source of information on the biology and phenology of these and other hemp pests has been developed by Colorado State University (https://hempinsects.agsci.colostate.edu/), but it is important to note that any pesticide suggestions on this website are not necessarily relevant and/or in compliance with California law. For questions about pesticide use in hemp in California, you should refer to the California Department of Pesticide Regulation website for cannabis/hemp (https://www.cdpr.ca.gov/docs/cannabis/index.htm).

Biological pesticides to aid current pest management efforts

A long-term, sustainable pest management program in hemp will be one that is integrated, employing multiple mechanical, cultural, biological, and chemical control tactics. However, implementing multiple control strategies can be difficult, as many research programs are only just beginning to investigate the biology, phenology, and life history of many hemp pests throughout the United States. Given the lack of products specifically registered for use on hemp, many growers appear to be relying on the use of biological pesticides. Information on biological pesticide trials recently conducted with hemp pests can be found in the journal Arthropod Management Tests at the links provided here:

- Laboratory Bioassays of Biological/Organic Insecticides to Control Corn Earworm on Hemp, 2019, Kadie Britt and Thomas Kuhar: https://academic.oup.com/amt/article/45/1/tsaa102/6002834

- Evaluation of Biological Insecticides to Manage Corn Earworm in CBD Hemp, 2020, Kadie Britt, T. David Reed, and Thomas Kuhar: https://academic.oup.com/amt/article/46/1/tsab108/6291448

- Evaluation of Biological Insecticides to Manage Cannabis Aphid in CBD Hemp, 2019, Kadie Britt and Thomas Kuhar: https://academic.oup.com/amt/article/46/1/tsab057/6224655

- Evaluation of Miticides to Control Hemp Russet Mite on Indoor Hemp, 2019, Kadie Britt and Thomas Kuhar: https://academic.oup.com/amt/article/45/1/tsaa082/5870575

Figure 4: *Hemp russet mites on underside of hemp leaf*

It is important to keep in mind that use of pesticides on hemp in California is only legal if the active ingredients found in the product are (1) exempt from residue tolerance requirements and from registration OR (2) exempt from residue tolerance requirements and use of the product would not be legally considered a use in conflict with the registered label. Before applying any pesticide in hemp, check with both the California Department of Pesticide Regulation (https://www.cdpr.ca.gov/docs/cannabis/questions.htm) and your local County Agricultural Commissioner (https://www.cdfa.ca.gov/exec/county/countymap/) regarding use in conflict and other labeling questions.

Parting Thoughts

Pest management in hemp will remain a challenge for the foreseeable future. Research is currently underway in California to determine the arthropod pest complex on hemp, characterize current management strategies, and screen novel chemical/biological controls. Information gained from this work will serve as a baseline for the development of improved monitoring and IPM strategies for hemp in California.

For more information on ongoing hemp pest management research in California, see https://treecrops.ucr.edu/cannabis or contact Kadie Britt at kadieb@ucr.edu. ■