

Pest Management of Hemp in Enclosed Production

Hemp Russet Mite

(*Aculops cannibicola*)

Damage and Diagnosis. Initial signs of infestation are subtle and easily missed. They can also vary among cultivars. A slightly curling along the edges of leaves is the most easily observed symptom, but this is not expressed in all plants. Others respond to having a general dullness of leaves (russetting). As infestations progress, areas of leaves may have visible yellow or brown spotting. Foliage also may become brittle and will sometimes break at the leaf petiole. Russet mites also develop on stems, which may appear more bronze/golden colored. When flower production begins some will feed on buds.

The hemp russet mite is extremely small – much smaller than the twospotted spider mite - and cannot be observed without some magnification unless present in enormous numbers. They have an elongate body and pale color, typical of most eriophyid mites (the mite family Eriophyidae). During heavy infestations flowering structures may take on a beige appearance, the combined result of leaf injuries and the color of the mites observed when as the mass on the heads.

The most serious damage reported occurs to maturing buds/flowers of all-female clones grown for CBD production. Extremely high populations of mites may build in late summer which damage these tissues and reduce yield and quality.

Biology Notes. *Cannabis* is the only reported host for hemp russet mite and attempts to establish it on related plants in the Cannabaceae family (hops, hackberry) have so far been unsuccessful.

The biology of hemp russet mite is very little studied but is likely similar in general outline to related species of eriophyid mites (e.g., tomato russet mite *Aculops lycopersici*) that feed on the surface of herbaceous plants. In the case of the tomato russet mite, eggs are produced that hatch within two days. A minute immature stage (larva) emerges from the egg and a couple of days later it will molt to the larger second stage (nymph). A few days later there is a final molt, producing the adults. Both males and females are produced. The entire life cycle (initially laid egg through first egg laying by the adult) is reportedly completed within about two weeks at temperatures of 77⁰F. Egg production by tomato russet mite is reported to typically average between 1 to 2 dozen per female.

Adults of tomato russet mite will normally live about 3 weeks. No special stages are produced that would allow extended survival, such as an egg that can remain dormant for an extended period. However, tomato russet mites are capable of surviving for an extended time between growing seasons on various nightshade plants as well as bindweed. During winter, reproduction ceases, and they are semi-dormant.

Hemp russet mite appears capable of surviving and reproducing year round on *Cannabis* crops grown indoors in continuous culture. However, significant questions remain about how hemp russet mites may survive outdoors between seasons. In June 2018 hemp russet mites were found

on leaves of volunteer hemp growing adjacent to a shed used to dry the crop of the previous season. This suggests that some hemp russet mites may survive outdoors in Colorado under certain conditions, although it is not clear on what kinds of plants they would be sustained in the absence of live hemp.

On their own, hemp russet mites can crawl only very short distances and immature stages are particularly immobile. However, adults are capable of some crawling and may move to the edge of leaves where they can then be picked up and carried on air currents; in enclosed areas, fans can quickly spread mites.

Management of Hemp Russet Mite

Prevention and Quarantine. As hemp russet mite reproduces solely on *Cannabis* plants, enclosed indoor plantings become infested through the introduction of infested plant materials (e.g., live plants, cuttings). Transfer by humans that have recently handled hemp russet mite infested plants is possible but likely a much less important means of infesting a greenhouse.

Strict quarantine steps are key to prevention of hemp russet mite becoming established at an indoor hemp production site. This primarily involves *isolating all new live plants/cuttings* from the primary growing area, *until the plants can be determined absolutely to be mite-free*.

No stages of hemp russet mite will be sustained on seed. Plants grown from seed will be free of hemp russet mite until they are infested from mites originating from other sources.

If hemp russet mites are present in an indoor production facility, the production of cuttings, the location of plants and their movement can be important in containing spread. New plants grown from cuttings should be disinfested in a way to eliminate hemp russet mites (as well as twospotted spider mite) and ideally all cuttings originate from hemp russet mite-free mother plants.

New plants should be located in sites that are completely isolated from older plants that are infested with hemp russet mite. Movements of workers between rooms should be arranged so that work with young (uninfested) plants never follows work among older (infested) plants, to avoid human transfers. It is also very important when designing a growing facility to give attention to air flow patterns so that air currents originating from areas where older plants are being grown do not flow to areas where new, younger plants are growing.

Biological Controls. The predatory mite *Amblyseius andersoni* is known to feed on hemp russet mites (and tomato russet mite). Predatory mites normally used to manage twospotted spider mite (e.g., *Phytoseiulus persimilis*, *Amblyseius californicus*) are not considered effective predators of russet mites.

Studies of predators of hemp russet mites on outdoor plantings have not yet been conducted. It is possible that some of the smaller predators found on the crop, such as minute pirate bugs, may feed on some russet mites.

Sprays and Dips. Various kinds of oils are available that can be used to help control hemp russet mite. These can be used as sprays of infested plants or as dips to kill mites on cuttings. However, only products that are specifically allowed by the Colorado Department of Agriculture can be used on hemp or any other Cannabis-based crop grown in the state. The list of specific products that are allowable is continuously updated and can be viewed at:

<https://www.colorado.gov/pacific/agplants/pesticide-use-cannabis-production-information>

Various highly refined mineral oils (e.g., Omni Oil, Suffoil-X) have probably been most widely used to spray plants for hemp russet mite (and twospotted spider mite). Also commonly used are various oils derived from seeds, such as neem, soybean, canola or cottonseed. Neem-derived oils are typically labeled as "clarified hydrophobic extracts of neem seed". These neem oil products do not contain azadirachtin, the insecticidal compound found in neem seeds that is found in some products (e.g., Azamax, Azasol) and is used to control aphids, whiteflies and certain other insects. (Azadirachtin is not effective against mites.) Both mineral oils and seed-derived oils primarily work by suffocation, coating the mite so that the openings on the body through which it breathes are blocked.

Some essential oils are also marketed for control of mites, including products which contain oils of rosemary, thyme, peppermint or clove, or other natural products. Testing of these on hemp russet mite is absent or very limited. Some of these (e.g., rosemary oil) have been found to have some effectiveness in managing twospotted spider mite. The essential oils may also act by smothering but some also may act as nerve poisons, affecting the octapamine receptors of susceptible insects and mites.

Oil sprays have no residual effects on plants and can only potentially kill mites that are covered with the oil at the time of application. Therefore, oils must be applied very thoroughly. Since hemp russet mites are so tiny they may shelter within very small cavities such as around leaf veins, in curled margins of leaves, or in folds within buds; sprays must reach all of these sites.

Oils are typically applied in concentrations of around 1% dilution. The possibility of phytotoxicity from oil sprays should always be considered. Plant injury is particularly likely to occur when applications are made during periods of high temperature and light; applications made indoors under dim light or outdoors during cool, overcast periods limit the likelihood of plant injury.

Russet mites are also susceptible to sulfur, and a few sulfur-containing insecticides are allowed by the Colorado Department of Agriculture in production of hemp and other Cannabis crops. However, plant injury can occur from oil sprays if sulfur residues are present on the crop.

Host-free Periods. Once established in an active growing area, hemp russet mite will be extremely difficult to eradicate when plants are in continuous production. However, hemp russet mite will die out in the absence of live plants and a host-free period can be used to kill-off mites in an infested facility. This will require an extended period during which no host plants are present. As *Cannabis* is the only host plant of the hemp russet mite and survival of the mites off the plants would be short (a couple of weeks maximum) in an indoor production facility with

warm temperatures, eradication should be possible with a host-free period of a month, perhaps less.

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