

Environmental Assessment

EA Number:
Case File No.:

Release of the Nematode, Subanguina (Paranguina) picridis (Kirjanova) Brzeski, for Control of Russian Knapweed, Acroptilon (Centaurea) repens (L.) DC. in the USA

Location of Proposed Action: It is proposed to release the nematode, Subanguina picridis, wherever its weedy host, Russian knapweed (Acroptilon repens) is a serious problem and there is local interest in using biological control against this pest.

Applicant: Sara S. Rosenthal, Research Entomologist, USDA-ARS-RWL, Bozeman, MT

Conformance with Applicable Land Use Plan: No such plan.

Need for Proposed Action:

The objective of releasing S. picridis is to suppress its weedy host, Russian knapweed, a widespread and serious plant pest in North America. This weed is found in 21 states in the USA, particularly in the arid western part of the country (Maddox, et al. 1985). It is a pest of grazing land, grainfields, waste places and irrigation ditches (Reed and Hughes 1970). Commonly infested crops are corn, alfalfa, sugar beets and forage-seed crops. Russian knapweed reduced wheat and corn yields up to 75 and 88% in the USSR (Watson 1980). Livestock avoid it because of its bitter taste. It is known to be toxic to horses (Young, et al. 1970) and to sheep (Everist 1981).

In the USSR the fauna and diseases of Russian knapweed have been studied for many years and S. picridis is considered the most valuable organism to use as a biological control. In the USSR up to 100% of knapweed plants inoculated with 100 g crushed gall material/m² were infected, over 20% of the infected plants were destroyed, and over 30% of them were severely damaged (Ivannikov 1966 and 1969 as reported by Watson 1986b). Where the author has seen Russian knapweed infested with this nematode in the USSR and Turkey the weed tends to grow as scattered, short, deformed stems rather than the thick stands of two to three foot tall shoots common in the USA. The widespread use of S. picridis against Russian knapweed in the USA is expected to similarly reduce the vigor and spread of this weed here and to greatly reduce the expenditures for pesticides now used for its control, including their monetary and ecological costs. It should also make it possible to suppress this weed in areas where it is now too expensive to spray or where it is ecologically difficult to do so.

Description of Proposed Action:

It is proposed to release the Russian knapweed nematode at several sites where its host plant is a serious problem in the USA. The first releases are planned for Wyoming, Montana, or other infested Northwestern states. Future releases may be made in diverse western, central, or eastern states (see Maddox et al 1985 for current USA distribution) depending on the future spread of this weed.

When dry nematode galls are surface sterilized with 1% sodium hypochlorite solution, washed with three rinses in sterile distilled water, cut and soaked in

water over night (Watson 1986a) the infective stage (second instar) nematodes become motile. They are able to infect their host one month after being revived by soil moisture (Watson 1986b). Such nematodes in soil may be scattered over Russian knapweed infestations or they may be released by spraying a solution of the nematodes in water. As the new knapweed shoots sprout up from the roots and emerge through infested soil they are attacked by these infective nematodes and new galls develop on the stems and leaves (Kovalev et al 1973).

Environmental Impacts:

<u>Critical Element</u>	<u>Affected</u>		<u>Critical Element</u>	<u>Affected</u>	
	Yes	No		Yes	No
Air Quality		X	T & E Species		X
ACECs		X	Wastes, Hazardous/Solid		X
Cultural Resources		X	Water Quality		X
Farmlands, Prime/Unique		X	Wetlands/Riparian Zones		X
Floodplains		X	Wild and Scenic Rivers		X
Native American Rel. Concerns		X	Wilderness		X

Description of Impacts:

Subanguina picridis has no impact on air quality.

S. picridis would have no negative impact on areas of critical environmental concern.

This nematode has no impact on cultural resources.

S. picridis would have no negative impact on prime or unique farmlands. As it is damaging to an introduced weed it may be expected to have some positive effect when its host is brought under control.

S. picridis will have no negative impact on floodplains. However, as its weedy host commonly grows in such moister areas it should have a significant positive effect as Russian knapweed is brought under control and is replaced by more desirable vegetation.

S. picridis would not have any negative effect on native American religious concerns. It could have a positive effect if Russian knapweed interferes with plants important in such religions.

S. picridis would have no effect on threatened or endangered species. The closest relatives to Russian knapweed in North America would be members of the genus Centaurea. Many of the introduced Centaurea species are considered weeds (Roche 1989). In fact diffuse and spotted knapweed, C. diffusa and S. maculosa, and yellow starthistle, C. solstitialis are very serious rangeweeds in North America that have been targeted for biological control since the 1950's. While the introduced C. calcitrapa, purple starthistle, and C. virgata ssp. squarrosa, squarrose knapweed, are more localized, biological control agents used against the more serious knapweeds are being released against them to try to prevent them from becoming more damaging. C. rothrockii and C. americana are the only native North American members of this genus. Neither plant is rare. C. rothrockii is an annual plant found at higher elevations in the mountains from southwest New Mexico and southeast Arizona south into Mexico (Moore 1972). C. americana is locally common in Texas, New Mexico, and Oklahoma and is occasionally found as far north as Kansas and Missouri (McGregor 1986). It is sometimes sold commercially as an attractive garden flower. S. picridis was tested for its ability to attack these species in laboratory and field tests.

In the laboratory, in California, such testing was part of an experiment conducted at warmer temperatures (minimum 17.5 -19.5°C; maximum 21.5-29°C) at the

request of APHIS-TAG (Rosenthal 1989). C. americana was not available for this experiment, but the nematode formed numerous (74) small (mean = 3.53 ± 1.64 mm) leaf galls distributed over 66% of the C. rothrockii plants. Nine of these galls (12%) contained infective second instar nematode larvae. This compared with the Russian knapweed controls where 33 and 53% of the plants from two different areas of California were infested, but the galls were larger (means = 4.99 ± 1.50 mm and 5.10 ± 1.50 mm) and a larger percentage of the galls (45 and 50%) produced infective nematode larvae.

At the request of APHIS-TAG, field research was also conducted on artichoke and the two North American Centaurea species during 1990 (Rosenthal, unpublished). At each of three sites (Okanogan, WA; Prineville, OR; and Charles M. Russell Preserve, MT) nematodes were released during April-May over three one-meter² plots containing the critical species planted in random quarters of each plot with the natural infestation of Russian knapweed left to grow in the fourth quarter. At Prineville, all the cultivated plants were destroyed by Coleophoridae caterpillars and no galls formed on Russian knapweed. In Montana, 41 galls containing about 87,500 infective stage nematodes (2134/gall) formed on 132 Russian knapweed stems in the three cages. In Washington, 34 galls containing approximately 32,500 infective nematodes (956/gall) formed on 112 stems. No nematode galls formed on the 27 artichoke plants that survived at these two sites. On C. rothrockii 6 galls with 1800 viable infective nematodes (300/gall) formed on the 98 plants in Montana while in Washington 91 small galls containing a total of 4000 nematodes (44/gall) formed on the 55 plants surviving there. One sterile gall formed on one of the 20 C. americana plants that survived only at Okanogan. These critical species are obviously very inferior hosts of the Russian knapweed nematode with fertile galls only forming in the field on C. rothrockii. As only the northernmost tip of C. rothrockii's range is found in the southernmost part of the USA and the nematode can only move a few centimeters under its own power it should be safe for general release against Russian knapweed in the USA.

S. picridis would have no impact on hazardous/solid wastes.

It would have no negative impact on water quality. However, if its use led to reduced spraying of herbicides for control of its host near waterways it would have a positive effect on water quality.

S. picridis would have no negative impact on wetlands or riparian zones, but it could have a positive impact if it reduced populations of its weedy host in such areas.

This nematode would have no negative impact on wild and scenic rivers, but, as in the case of other aquatic areas, it could have a positive impact by reducing its host's populations.

S. picridis would have no negative impact on wilderness. Any control it might exert on Russian knapweed invading wilderness areas would be beneficial.

Description of Mitigation Measures and Residual Impacts:

While there is little chance that Subanguina picridis would have any negative impact, if any problem was found the effect of the nematode could be mitigated by any nematocide or by reducing the nematodes populations by destroying its host, spreading fertilizer, or reducing irrigation (see Watson 1986b for conditions detrimental to S. picridis).

FINDING OF NO SIGNIFICANT IMPACT/DECISION RECORD.

I have reviewed this environmental assessment including the explanation and resolution of any potentially significant environmental impacts. I have determined that the proposed action with the mitigation measures described below will not have any significant impacts on the human environment and that an EIS is not required. It is my decision to implement the project with the mitigation measures identified below.

Mitigation Measures/Remarks:

References

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