

Italian experience in biological control of *Dryocosmus kuriphilus*

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The chestnut gall wasp, *Dryocosmus kuriphilus* Yasumatsu (Hymenoptera, Cynipidae), is the most important global insect pest of chestnut trees (*Castanea* spp.) and is classified by the European and Mediterranean Plant Protection Organization (EPPO, 2005) as a quarantine organism. Recently *D. kuriphilus* has been detected in Nepal (Abe *et al.*, 2007) and also in Europe, first in Italy in 2002 (Brussino *et al.*, 2002) and later in Slovenia, France and Switzerland. The European chestnut (*C. sativa* Mill.) is one of the most important broad-leaved trees in Italy. The chestnut represents 9% of the Italian forests and is present in each of the twenty Italian regions. Chestnut growing for fruit and wood production has a valuable role in the local economy of mountainous and hilly areas in many regions.

Despite the research carried out to fight *D. kuriphilus* using chemicals and the selection of resistant cultivars (Sartor *et al.*, 2009), the most effective means of control of the pest is the classical biological method based on the use of the natural enemy *Torymus sinensis* Kamijo (Hymenoptera, Torymidae) (Moriya *et al.*, 2003). Control using *T. sinensis* was initiated in Japan in the 1980's and was successful in both Asia and the United States (Cooper and Rieske, 2007). A release program, funded by the local government Regione Piemonte, was started in Italy in 2003 (Quacchia *et al.*, 2008) thanks to the assistance from the National Agricultural Research Center in Tsukuba. From 2003 to 2008 potentially parasitized withered galls were sent from Japan to Italy. These galls were reared to obtain the parasitoid *T. sinensis*.

During the first two years of the program, preliminary studies led to a successful method of rearing imported galls with synchronization between the emergence of the parasitoid and the presence of the target galls in field. *T. sinensis* specimens were also used to carry out trials concerning its biology and host range.

From 2005 on, the parasitoid was released in open fields every spring. A total of 95 release points were achieved in 2009 (Fig. 1). Establishment of the parasitoid was verified in some sites by the collection of galls during winter. Although the percentage of parasitization by *T. sinensis* varied among sites (from 0.5% to 25.5%), the establishment has been confirmed in each site and the parasitization trend continues.

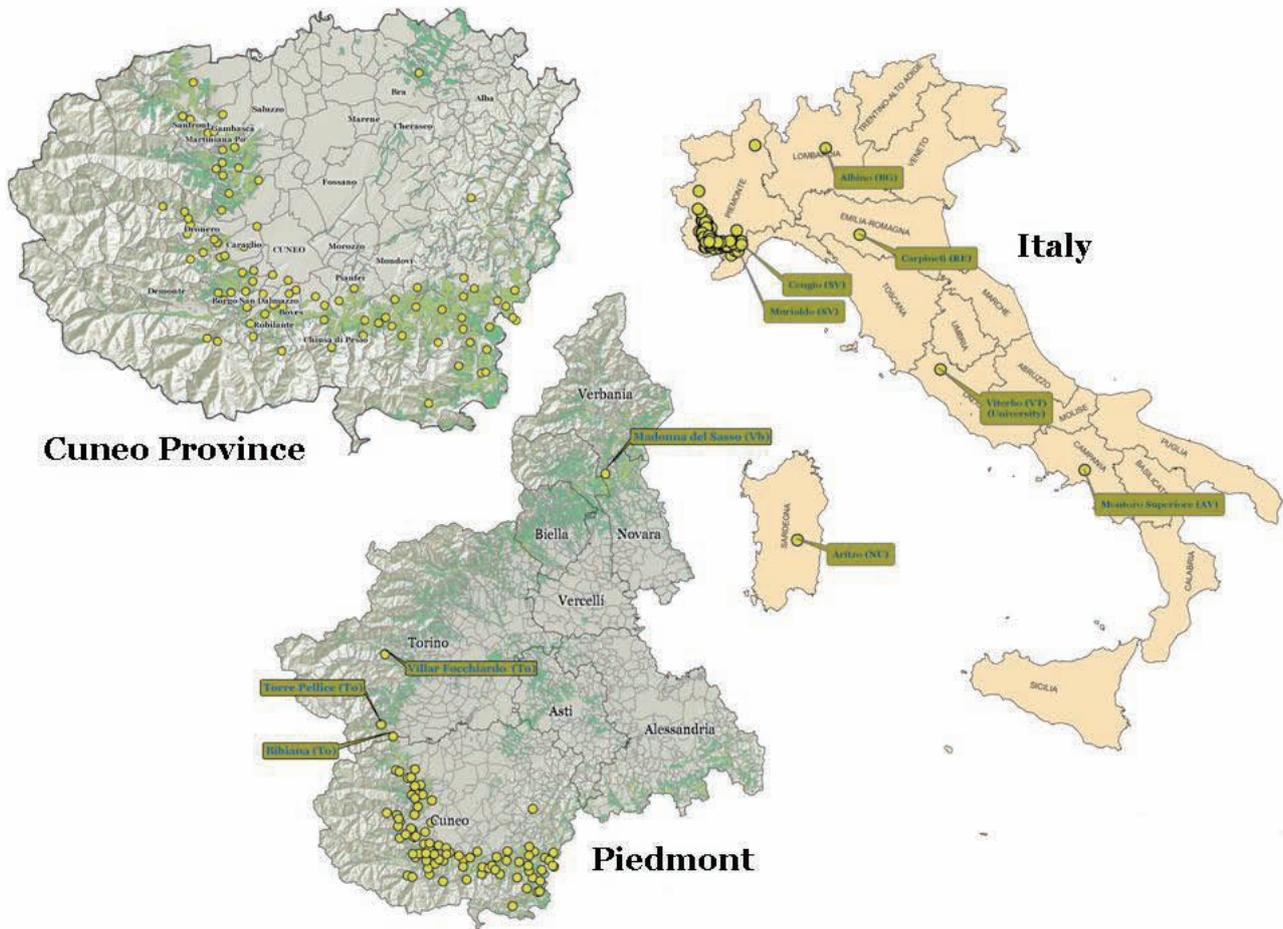


Fig. 1. Release points in Cuneo Province, Piedmont and Italy

In 2006 a rearing area was set up; it was an isolated orchard several kilometres far from other chestnut trees, with a high gall infestation rate and a small tree size (Fig. 2). Here the parasitoid population was expected to potentially increase rapidly as the isolation could increase the density of the insect by restricting dispersal (Moriya *et al.*, 1990). This area was established as a source of parasitized galls to obtain specimens to release in other sites (the small size of the trees makes collection easy), and new rearing areas were set up in the following years. Table 2 shows data about the first rearing area.



Fig. 2. View of the rearing area

Table 2. Couples released and *Torymus sinensis* obtained from the rearing area

	couples released	galls collected	<u><i>T. sinensis</i> emerged</u>			sex ratio	% parasitisation
			females	males	total		
2006	80	-	-	-	-	-	-
2007	80	28,000	80	94	174	46.0	0.6
2008	-	29,000	671	401	1,072	62.6	3.7
2009	-	19,900	2,670	1,933	4,603	58.0	23.1

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