

## Introduction

*Ailanthus altissima* is considered an invasive weed in natural ecosystems in Europe (Europe, R 2019/1262). Its invasion alters the ecosystem functioning, modifying native plant communities and wildlife habitat and threatening biodiversity. The Conservation Park of Serra de Collserola in Barcelona (Catalonia, Spain) has an area of 8,300 ha of which 40 ha have been invaded by *A. altissima*. Glyphosate is one of the most effective herbicide for this species, but because of a ban for its use in many cities in Barcelona region, other active ingredients should be tested. The use of herbicides is known as an effective method (Burch and Zedaker 2003).

## Objectives

Evaluation of effectivity of different active ingredient by using different three techniques, stem injection, cut stump and basal bark in autumn.

## Materials and methods

Three different herbicides were applied diluted in water (Triclopyr + aminopyralid, Fluroxypyr and Clopyralid + triclopyr) during October 2021. Every product was applied to a group of 10 trees with 3 replications plus a control in trees with diameters less than 10 cm. In stem injection, four holes were done with a drill using an 8 mm drill bit on the basal part of the uncut trunks, applying the herbicides with a syringe into the holes. Four holes were also done for cut stump application, in which trees were cut above the holes, applying the herbicides with a syringe into the holes. For basal bark, herbicides were applied using a brush, painting the first 100 cm of the stem. The same amount of broth was applied for each technique. For control trees only water was applied (Figures 1, 2 and 3). Survival of the trees was monitored three times (April, June and September 2022), monitoring the affection of the trees (dead or alive) (Table 1).

Date of application	Treatments	Techniques	Dose (%)	*ai (ml)
October 2021	Triclopyr 24% + aminopyralid 3% (Tordon Star, Corteva)	Stem injection	60	1,2 + 0,2
	Fluroxypyr 20% (Starane 20, Corteva)	Cut stump	75	1,4
	Clopyralid 6% + triclopyr 24% (Silvanet, Corteva)		80	0,5 + 2,1
	Control: water	Basal bark	100	

Table 1. Characteristics of applications, \* active ingredient injected per tree.



Fig 1. Stem injection detail.



Fig 2. Cut stump injection detail.



Fig 3. Basal bark detail. Stems have been painted below the blue mark.

## Results and discussion

Cut stump was the only method that controlled all trees at the first count (6 month after treatment, MAT). Stem injection was the only technique that achieved total effectivity at the third count (11 MAT), and fluroxypyr was the slowest herbicide. Complete mortality for basal bark technique was observed at third count, except fluroxypyr that did not control all trees. Control trees did not show enough effectivity as expected (Figures 4, 5 and 6).

As in our cut stump injection results, other authors found that the combination of cutting trees plus herbicide gave better results than only herbicide application. Another important point, is that results should be evaluated for more than one year, to prevent undesirable results by resprouts (Kowarik & Saumel, 2007). Monitoring for few years showed that resprouts can appear (Fogliatto *et al.*, 2020). Other studies found that basal bark applications with fluroxypyr gave better results than Triclopyr in *Triadica sebifera* trees (Enloe *et al.*, 2015).

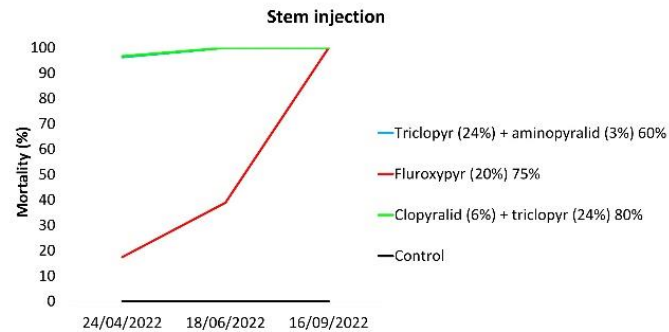


Fig. 4. Mortality of trees treated by stem injection during October 2021 (diameter < 10cm). Triclopyr + aminopyralid and Clopyralid + Triclopyr had identical results.

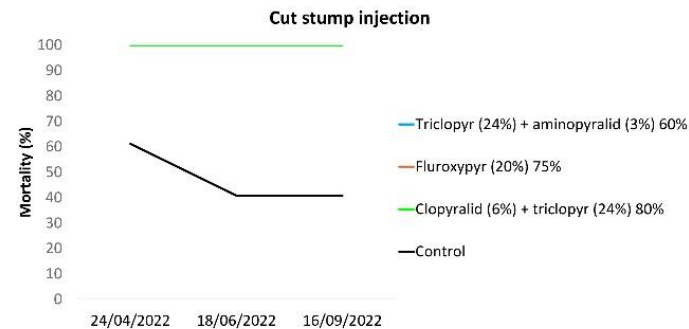


Fig. 5. Mortality of trees treated by cut stump injection during October 2021 (diameter < 10cm). All treatments except control trees, had identical results.

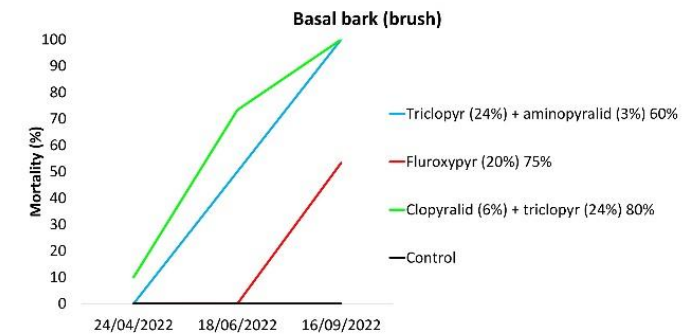


Fig. 6. Mortality of trees treated by basal bark during October 2021 (diameter < 10cm).

## Conclusions

Triclopyr + aminopyralid and Clopyralid + triclopyr are effective for diameters less than 10 cm for our three techniques. The addition of a surfactant or oil for basal bark treatments, could improve the effectivity (Burch and Zedaker, 2003).

As many prohibitions of active ingredients occurs in Europe, fluroxypyr could be an alternative to glyphosate or commercial mixtures that contain triclopyr. This work is part of a PhD, and final results will contain evaluation along three years.