Control of *Apion trifolii* in red clover seed production

Serge Bouet
French seed growers association (F.N.A.M.S.)
2701 route d'Orléans - B.P. 10- 18 230 Saint Doulchard
E-mail:serge.bouet@fnams.fr

Abstract:

Clover seed weevil (*Apion trifolii L.*) is the main pest on red clover seed production (*Trifolium pratense L.*). Larvae consume clover seeds and can cause severe yield losses. Seed growers are usually advised to administer two or three applications of insecticide to control pests before the female lays their eggs in the flower bud.

Some efficient active ingredients have been banned these last years and only one (*bifenthrine*) is still able to control *apion trifolii* attacks. But the amount of permitted *bifenthrine* has been reduced during flowering time since 2005 and recently *bifenthrine* has been also withdrawn in the EU. So no more efficient registered pesticide will be available from the 30th May 2010. With the means currently available, it is not possible to avoid attacks without chemical solutions. Growing organic red clover is difficult especially because of apion trifolii. One possibility to avoid attacks of clover seed weevil could be to delay the spring mowing so eggs and larvae could be destroyed and the next flowering would be less sensitive to the weevil damage. But our experimental results indicate that the egg-laying period is so long that it requires a very late cutting which leads to an inappropriate date of seed harvest.

Recently, new insecticides have been tested in FNAMS trials to control this insect successfully. *Spinosad* which could be used for organic production and *acetamépride*, and *thiaclopride* have already shown interesting results. They are promising alternative and need to be registered for red clover seed production. The specific action of spinosad (ovi-larvicidal activity) should allow a new threshold of treatment to be defined.

Key words: Clover seed weevil (*A. trifolii L.), acetamipride*, *thiaclopride*, *spinosad*, alternative control.

Introduction

Clover seed weevil (*Apion trifolii L.*) is the main pest on red clover seed production (*Trifolium pratense L.*). Larvae consume clover seeds and can cause severe yield losses. Two or three insecticide applications of *bifenthrine* are usually advised to the seed growers to control pest before the female lays their eggs in the flower bud. To avoid problem of resistance, research has been carried out since 2000 to find new chemical solutions or alternative methods. Recently *bifenthrine* has been banned also and the problem becomes greater.

Materials and Methods:

Field experiments were carried out from 2004 to 2009 in three locations in France: near Angers (northwest of France), Chateauroux and mainly near Bourges (central France). The threshold to apply insecticide before flowering time is one hundred clover seed weevils caught in 25 semicircles of butterfly net. At ripeness, 4 × 50 inflorescences are collected before harvest to establish the number of good seed /inflorescence, which is one of the best ways to appreciate the pesticide's efficiency.

Also, the clover crops are harvested directly with an experimental combiner. Seed samples are cleaned and seed yield is calculated for each sample.

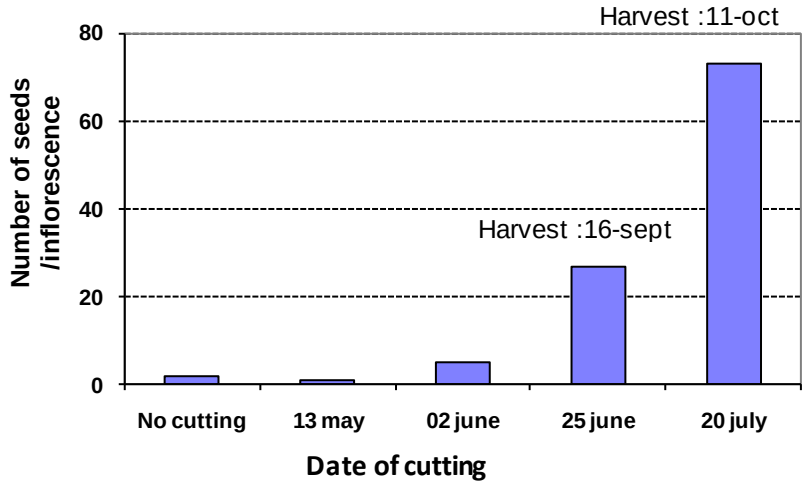
Results and discussion:

- **Alternative method**:

Some trials have been carried out for organic farming. *Roténone, natural pyrethrinoid, azadirachtine,* plant manure have been tested unsuccessfully to control *apion trifolii* attacks. (Bouet 2003). Another method has been tested without chemical: One possibility to avoid attacks of clover seed weevil could be to delay the spring mowing; so eggs and larvae could be destroyed and the next flowering would be less sensitive to the weevil damage.

Four dates of cutting from May (normal date) to July are compared to one modality without cutting. Our experimental results indicate the egg-laying period is so large that it requires a very late cutting which leads to an inappropriate date of seed harvest.

Figure 1: Effect of the date of cutting on the number of seeds /inflorescence in organic red clover seed production – (FNAMS/ARVALIS Chateauroux, 2004)

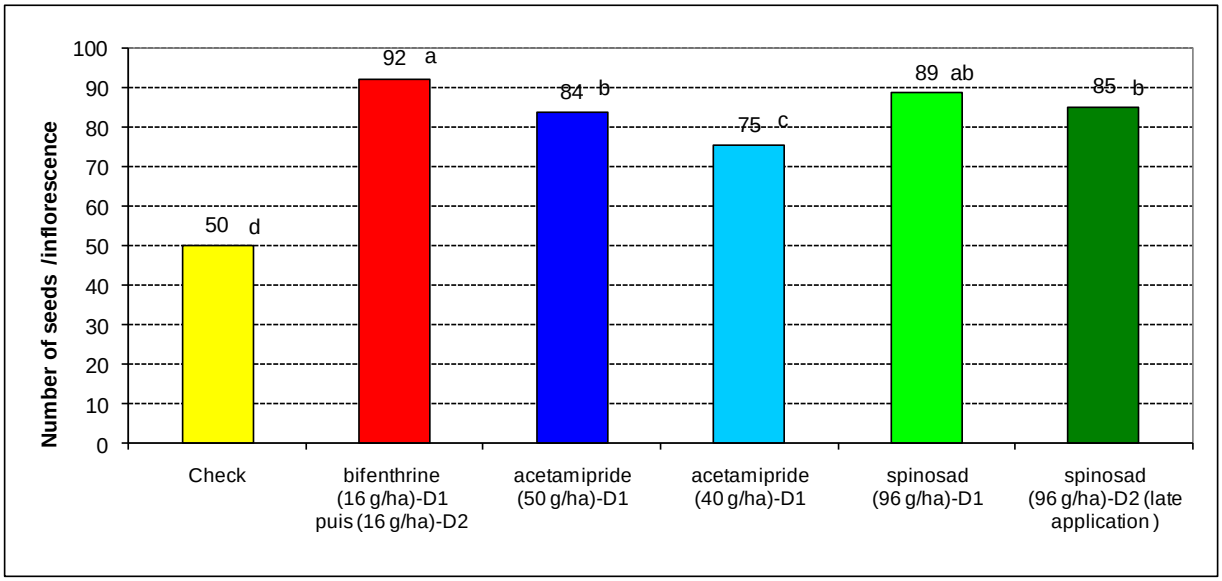


- ***Acetamipride* trials**:

Acetamipride (50 g. a. i. /ha) has been studied for five years and has shown very good results to control *apion trifolli* damage. *Acetamipride*'s efficiency on *apion trifolli* adult is always prompt and more persistent than the reference (*bifenthrine*). The number of seed per inflorescence is

similar to the reference but with less application (ex: 2008) which is showing a high efficacy level. At a lower rate (40g a. i./ha.), *acetamipride*'s efficiency seems to decrease regarding to the results on number of seed/inflorescence (Bourges 2008).

Figure 2: Insecticide effects on the number of seeds /inflorescence in red clover seed production (FNAMS Bourges, 2008) (Date of spraying : D1= 25/06/08 D2= 01/07/08)



- ***Thiaclopride* trials**:

Only one year trials (2009) has been carried out recently with *thiaclopride* (62.5g a.i./ha + *deltaméthrine* 6.25g . a. i./ha). This association has shown the same results as *acetamipride* in a single application with a prompt and persistent efficiency on adult. Number of seed /inflorescence and seed yield obtained are better than with one application of *bifenthrine.*

Figure 3: Insecticide effects on apion triflolii population in red Clover seed production (FNAMS Bourges, 2009)

D1: Date of spraying: 12/06/09

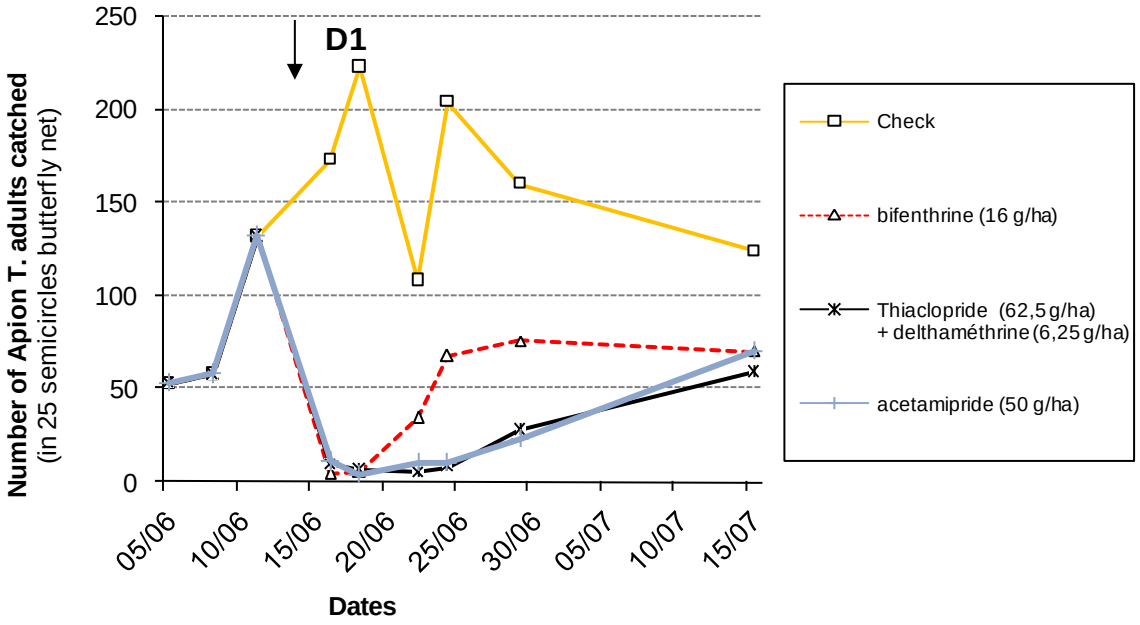
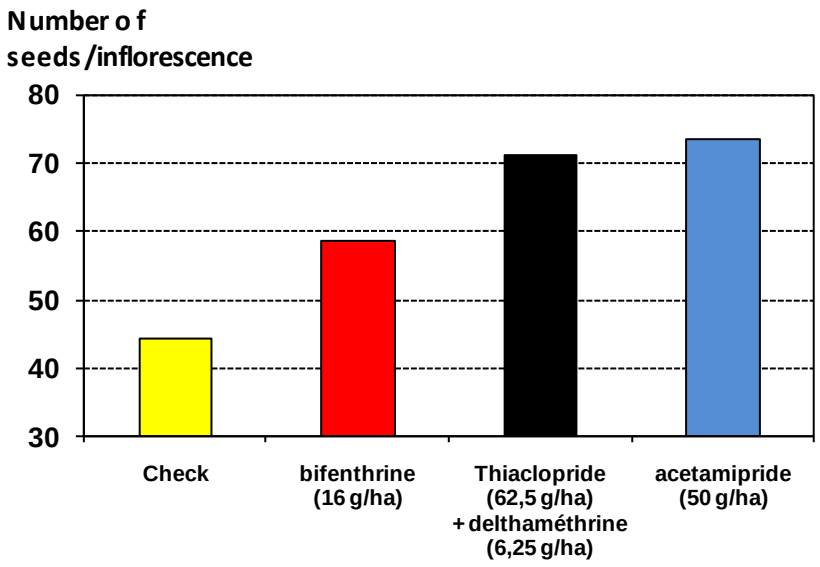


Figure 4: Insecticide effects on the number of seeds /inflorescence in red clover seed production (FNAMS – Bourges, 2009) (Date of spraying : D1= 12/06/09)



- ***Spinosad* trials**:

Spinosad has been tested during four years at the rate of 96g. a.i. /ha (figure 2) (this active ingredient could be used also for organic crop). It shows an incomplete control of seed weevils

population. However, in spite of this lower efficacy level on adult, it gives interesting results on seed yield with a number of seed/inflorescence similar to the reference *bifenthrine*. Looking at these effects, there is one possible explanation: *spinosad* has ovi-larvicidal activity which has been proved in 2008 with a late application. Seed yield with a normal date of application of *spinosad* are the same as those obtained with a late application. That means the threshold to apply *spinosad* could be larger than with a standard pesticide. But without bee label, *spinosad* could be used only before flowering time.

Conclusion:

These results provide new chemicals solutions to avoid *Apion Trifolii* damage which need to be registered for red clover seed production. For organic seed production, no alternative method has been found and only *spinosad* could be used before flowering time.