# CONTROL OF COLORADO POTATO BEETLE LARVAE'S WITH BIOINSECTICIDES AND PLANTS METABOLIC EXTRACTS

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**Abstract**

Synthetic chemical insecticidesis one ofreal fighting concept sandshows that one of the alternative solutions in bioculture and refers to the use of organic insecticides subststanteas vegetable orvarious compound saffecting the behaviour of insects. Bioactivity plants depends on the presence of bioactive compound sand plantinter ference that occurs from the use of various components of the plant that has the properties of inhibiting feeding insects (the quantum P., et all, Berindei M., 2002). An important rolein the evolution of the ways to fightitare secondary metabolites, especially as they involvea mortality ofover 50%, sometimes 80-90%. Even if the application of plant extract shave not kille but inhibition offeeding.

**Key words:** plants extracts**,** bioinsecticides, chimical treatments , efficacy

The use of synthetic chemical insecticides is one of there alfighting concepts and show that any alternative solution sinbioculture refers to the use of organic insecticides plant substrate or different compound safecting insect behavior. The bioactivity of plants depends on the presence of bioactive compound swhich are, by the use of specific compounds with inhibitory properties (Cunat P., et all, 1990). An important role in the evolution of biological battle mode are secondary metabolites, especially as they involvea mortality ofover 50%, sometimes 80-90%.

## MATERIAL AND METHOD

Experiments or actual field conditions with metabolic extracts and commercial bioinsecticides. In the state of larval counting was conducted on fiv potato bushesmarked and treatments were performed throughout eachvariant have (Moran, 1983; Brudea, 2008). The number of larvae was recorded before and after treatment, by age, for each potato plant. Planting was done manually, the distance between plants in the row was 0.3m between rowsand 0.7m between such versions, using an amount no solution has been chosen for use for small capacity pumps. The products tested were evaluated where some have recorded a 100% mortality, and in some versions efficacy was calculated using the formula- Săvescu Iacob.

Metabolis mofdried plant extracts are drie dandmilled using 25g/ l of cold water, stirred for 24 hours. After filtration plant extracts have a concentration of 10%.

In all experimentation years it used, the traditional technology of potato crop. The fertilization was done in relation to the requirements of plants and the chemical elements in the soil. Also, the number of blight (*Phytophthora infestans (*Mont.) de Bary) treatments varied between 4 and 8 (Berindei M., 2002). As priorit used the spring barley.

## RESULTS AND DISCUSSIONS

Table 1 presents data on mortality of Colorado potato beetle larvae for different time intervals after completion of treatment. We have used three types: commercial bioinsecticides (variants 1-4), as standard it used an insecticide and different metabolic products extracted from various plants have been used alone or in various combinations (variants 6-18).

Looking at the types of products used, we can say that the bioinsecticides have different effects, so that at the product Laser 240 SC, mortality was 100% in the first day, other products have caused a mortality of 38% at NeemAzal T/S on dose of 3.0 l/ha, 16% NeemAzal T/S on dose of 2.5 l/ha and 10% EC Milbeknock at a dose of 0.75 l/ha, reaching in the third day of 56% to NeemAzal T / S in a doses of 3.0 l/ha and about 35 % in the other two organic products, and after nine days, in variant three, the effect was 85%, 75% at variant two, and 35% at variant four. At the insecticide Faster10 EC in dose of 0.1 l/ha, the effect on larvae was total in the first day of the treatment. At the metabolic extracts (variants 6-18) effect on larval mortality was low, ranging between 0-29% in the first day, between 0-26% after three days, between 0-69% after seven days

and between 0-85% after nine days. The best results were obtained in combination *Tanacetum vulgare* L. + *Artemisia absinthium* L. and *Athyrium filix-femina* (L.) Roth.

Table 1

**Dynamics of larval mortality (%) after the first treatment**

| Var. | Tested products | After the first treatment (06.06.2007) at : | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 day | | 3 days | | 7 days | | 9 days | |
| | | % | dif. | % | dif. | % | dif. | % | dif. |
| 1 | Laser 240 SC 80 ml/ha | 100 | 2 | 100 | 1 | 100 | 1 | 100 | 0 |
| 2 | NeemAzal T/S 2,5 l /ha | 16 | -82 $^{ooo}$ | 35 | -64$^{ooo}$ | 56 | -43$^{ooo}$ | 75 | -25$^{ooo}$ |
| 3 | NeemAzal T/S 3 l /ha | 38 | -60 $^{ooo}$ | 56 | -43$^{ooo}$ | 72 | -27$^{oo}$ | 85 | -15$^{ooo}$ |
| 4 | Milbeknock EC 0,75 l /ha | 10 | -88 $^{ooo}$ | 30 | -69$^{ooo}$ | 33 | -66$^{ooo}$ | 35 | -65$^{ooo}$ |
| 5 | Faster 10 EC 0,1 l /ha -mt | 98 | mt | 99 | mt | 99 | mt | 100 | mt |
| 6 | *Aconitum vulparia* L. | 0 | -98 $^{ooo}$ | 0 | -99$^{ooo}$ | 0 | -99$^{ooo}$ | 0 | -100$^{ooo}$ |
| 7 | *Dryopteris filix-mas* (L.) Schott | 16 | -82 $^{ooo}$ | 18 | -81$^{ooo}$ | 23 | -76$^{ooo}$ | 43 | -57$^{ooo}$ |
| 8 | *Tanacetum vulgare* L. | 0 | -98$^{ooo}$ | 0 | -99$^{ooo}$ | 0 | -89$^{ooo}$ | 0 | -100$^{ooo}$ |
| 9 | *Stachys sylvatica* L. | - | - | - | - | - | - | - | - |
| 10 | *Sambucus ebulus* L. | 4 | -94$^{ooo}$ | 12 | -87$^{ooo}$ | 16 | -83$^{ooo}$ | 19 | -81$^{ooo}$ |
| 11 | *Artemisia absinthium* L. | 0 | -98$^{ooo}$ | 0 | -99$^{ooo}$ | 4 | -95$^{ooo}$ | 52 | -48$^{ooo}$ |
| 12 | *Tanacetum vulgare* L.+ *Sambucus ebulus* L. | 0 | -98$^{ooo}$ | 1 | -98$^{ooo}$ | 6 | -93$^{ooo}$ | 21 | -79$^{ooo}$ |
| 13 | *Tanacetum vulgare*L. + *Sambucus ebulus*L. + *Artemisia absinthium*L. | 0 | -98$^{ooo}$ | 0 | -99$^{ooo}$ | 0 | -99$^{ooo}$ | 1 | -99$^{ooo}$ |
| 14 | *Aconitum vulparia*L. + *Dryopteris filix-mas* (L.) Schott+ *Tanacetum vulgare*L. + *Stachys sylvatica*L. | 0 | -98$^{ooo}$ | 0 | -99$^{ooo}$ | -24 | -75$^{ooo}$ | 50 | -50$^{ooo}$ |
| 15 | *Artemisia absinthium*L.+*Athyrium filix-femina*(L.) Roth | - | - | - | - | - | - | - | - |
| 16 | *Aconitum vulparia*L. + *Tanacetum vulgare*L.+ *Sambucus ebulus*L. | - | - | - | - | - | - | - | - |
| 17 | *Tanacetum vulgare*L.+ *Artemisia absinthium*L. | 15 | -83$^{ooo}$ | 23 | -76$^{ooo}$ | 66 | -33$^{ooo}$ | 79 | -21$^{ooo}$ |
| 18 | *Athyriumfilix-femina*(L.) Roth | 22 | -76$^{ooo}$ | 26 | -73$^{ooo}$ | 69 | -30$^{ooo}$ | 85 | -15$^{ooo}$ |
| | DL 5% | | 6 | | 9 | | 16 | | 8 |
| | DL 1% | | 8 | | 12 | | 22 | | 11 |
| | DL 0,1% | | 10 | | 16 | | 29 | | 14 |

If we corroborate the table 1 which represents the attack degree, we find after nine days of the treatment appliance, some metabolic extracts induce metabolic inhibition of feeding, whereas no harm produced in leaf area than in a relatively small proportion up to 10-15%. In this regard it is noted the obtained product from *Tanacetum vulgare* L. and the combination between *Aconitum vulparia* L. and *Tanacetum vulgare* L. + *Sambucus ebulus* with 10% attack degree, the extract from *Aconitum vulparia* L. and combination of *Tanacetum vulgare* L. and *Artemisia absinthium*L. and extract from *Athyrium filix-femina* (L.), determined an attack rate on 15%.

In conclusion, we can say that the lowest attack occurred in the variants treated with insecticide Faster 10 EC and bioinsecticides Laser 240 SC, followed by versions two, three and four, and the best results were obtained of metabolites in variants 8 and 17, even though the extract of *Tanacetum vulgare* L. does not cause mortality.

The second treatment after 20 days from the first intervention was performed. At this time on the potato bushes were larvae ages L1-L4, but in a higher percentage of larvae dominated the early ages to the L3-L4. The control of larvae in the second treatment indicates a mortality dynamic similar with first treatment, the only essential difference was that mortality which was higher during the first seven days of treatment two compared with first treatment (*tab. 2*). So, it happened because of relatively high percentage of larvae L1 and L2 in which the used products have an efficiency greater than those of L3 and L4, and as a possible result of the residual effect of the first treatment (Enea, 2012; Tălmaciu et all., 2012).

Table 2

**Dynamics of larval mortality (%) after the second treatment**

| Var. | Tested products | After the second treatment ( 26.06.2007 ) at : | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 day | | 3 days | | 7 days | | 9 days | |
| | | % | dif. | % | dif. | % | dif. | % | dif. |
| 1 | Laser 240 SC 80 ml/ha | 100 | 3 | 100 | 0 | 100 | 0 | 100 | 0 |
| 2 | NeemAzal T/S 2,5 l /ha | 22 | -75 $^{ooo}$ | 38 | -62 $^{ooo}$ | 66 | -34 $^{ooo}$ | 88 | -12 |
| 3 | NeemAzal T/S 3 l /ha | 50 | -47 $^{ooo}$ | 70 | -30 $^{ooo}$ | 87 | -13 $^{o}$ | 97 | -3 |
| 4 | Milbeknock EC 0,75 l /ha | 14 | -83 $^{ooo}$ | 31 | -69 $^{ooo}$ | 43 | -57 $^{ooo}$ | 48 | -52 $^{ooo}$ |
| 5 | Faster 10 EC 0,1 l /ha - mt | 97 | mt | 100 | mt | 100 | mt | 100 | Mt |
| 6 | *Aconitum vulparia* L. | 0 | -97 $^{ooo}$ | 0 | -100 $^{ooo}$ | 0 | -100 $^{ooo}$ | 0 | -100 $^{ooo}$ |
| 7 | *Dryopteris filix-mas* (L.) Schott | 23 | -74 $^{ooo}$ | 28 | -72 $^{ooo}$ | 36 | -64 $^{ooo}$ | 40 | -60 $^{ooo}$ |
| 8 | *Tanacetum vulgare* L. | 0 | -97 $^{ooo}$ | 0 | -100 $^{ooo}$ | 0 | -100 $^{ooo}$ | 0 | -100 $^{ooo}$ |
| 9 | *Stachys sylvatica* L. | 33 | -64 $^{ooo}$ | 55 | -45 $^{ooo}$ | 66 | -34 $^{ooo}$ | 46 | -54 $^{ooo}$ |
| 10 | *Sambucus ebulus* L. | 9 | -88 $^{ooo}$ | 20 | -80 $^{ooo}$ | 21 | -79 $^{ooo}$ | 22 | -78 $^{ooo}$ |
| 11 | *Artemisia absinthium* L. | 3 | -94 $^{ooo}$ | 6 | -94 $^{ooo}$ | 18 | -82 $^{ooo}$ | 51 | -49 $^{ooo}$ |
| 12 | *Tanacetum vulgare*L.+ *Sambucusebulus* L. | 2 | -95 $^{ooo}$ | 4 | -96 $^{ooo}$ | 13 | -87 $^{ooo}$ | 16 | -84 $^{ooo}$ |
| 13 | *Tanacetum vulgare*L. + *Sambucus ebulus*L. + *Artemisia absinthium*L. | 0 | -97 $^{ooo}$ | 12 | -88 $^{ooo}$ | 12 | -88 $^{ooo}$ | 13 | -87 $^{ooo}$ |
| 14 | *Aconitum vulparia*L. + *Dryopterisfilix-mas* (L.) Schott+ *Tanacetum vulgare*L. + *Stachys sylvatica*L. | 2 | -95 $^{ooo}$ | 8 | -92 $^{ooo}$ | 15 | -85 $^{ooo}$ | 17 | -83 $^{ooo}$ |
| 15 | *Artemisia absinthium*L.+*Athyrium filix-femina*(L.) Roth | 2 | -76 $^{ooo}$ | 29 | -71 $^{ooo}$ | 36 | -64 $^{ooo}$ | 36 | -64 $^{ooo}$ |
| 16 | *Aconitum vulparia*L. + *Tanacetum vulgare*L.+ *Sambucus ebulus*L. | 17 | -80 $^{ooo}$ | 25 | -75 $^{ooo}$ | 29 | -71 $^{ooo}$ | 40 | -60 $^{ooo}$ |
| 17 | *Tanacetum vulgare*L.+ *Artemisia absinthium*L. | 13 | -84 $^{ooo}$ | 22 | -78 $^{ooo}$ | 46 | -54 $^{ooo}$ | 75 | -25 $^{oo}$ |
| 18 | *Athyrium filix-femina*(L.) Roth | 2 | -74 $^{ooo}$ | 38 | -62 $^{ooo}$ | 70 | -30 $^{ooo}$ | 93 | -7 |
| | DL 5% | | 9 | | 11 | | 12 | | 18 |
| | DL 1% | | 12 | | 14 | | 16 | | 24 |
| | DL 0,1% | | 16 | | 19 | | 21 | | 32 |

Calculation of effectiveness to nine days after completion of the two treatments was done using the formula effectiveness Iacob - Săvescu, when taking into account the individuals living in the untreated control. Table 3 suggest that after nine days after the execution of the second treatment shows an increase in efficacy in the majority of variants in comparison with first treatment. In addition to variations 9, 10, 15 and 16 were made effectiveness between 7.0 and 24.2%, compared with the first treatment when the efficacy of these variants was 0. This is explained by the higher proportion of young L1-L2 larvae, which have a much higher sensitivity to treatments in comparison with last two ages.

Table 3

**Product efficacy after nine days of the treatment appliance**

| Var. | Tested products | Efficacy % | |
|---|---|---|---|
| | | After the first treatment | After the second treatment |
| 1 | Laser 240 SC 80 ml/ha | 100,0 | 100,0 |
| 2 | NeemAzal T/S 2,5 l /ha | 73,5 | 81,2 |
| 3 | NeemAzal T/S 3 l /ha | 82,4 | 84,4 |
| 4 | Milbeknock EC 0,75 l /ha | 17,2 | 19,3 |
| 5 | Faster 10 EC 0,1 l /ha | 100,0 | 100,0 |
| 6 | *Aconitum vulparia* L. | 0,0 | 0,0 |
| 7 | *Dryopteris filix-mas* (L.) Schott | 9,3 | 10,1 |
| 8 | *Tanacetum vulgare* L. | 0,0 | 0,0 |
| 9 | *Stachys sylvatica* L. | 0,0 | 16,0 |
| 10 | *Sambucus ebulus* L. | 0,0 | 7,0 |
| 11 | *Artemisia absinthium* L. | 46,0 | 48,1 |
| 12 | *Tanacetum vulgare*L.+ *Sambucus ebulus*L. | 0,0 | 0,0 |
| 13 | *Tanacetum vulgare*L. + *Sambucus ebulus*L. + *Artemisia absinthium*L. | 0,0 | 0,0 |
| 14 | *Aconitum vulparia*L. + *Dryopteris filix-mas* (L.)+ *Tanacetum vulgare*L. + *Stachys sylvatica* L. | 41,0 | 11,5 |
| 15 | *Artemisia absinthium*L.+*Athyrium filix-femina*(L.) | 0,0 | 24,2 |
| 16 | *Aconitum vulparia*L.+ *Tanacetum vulgare*L. + *Sambucus ebulus*L. | 0,0 | 23,5 |
| 17 | *Tanacetum vulgare*L.+ *Artemisia absinthium*L. | 72,8 | 74,5 |
| 18 | *Athyrium filix-femina*(L.) | 84,2 | 84,8 |

At the variants treated with NeemAzal T/S, although larval mortality in the first days was reduced, the larvae did not show an intense feeding activity. Due to the fact that consumption is much lower, the larvae of these variants shows another color to existing larvae on the variant treated with product Milbeknock EC, where they present normal feeding activity and normal coloration.

After performing the treatment with the products extracted from plants was observed on the treated variants, some symptoms of the simple discoloration of plant lines as in the case of *Tanacetum vulgare*L. extract, to severe fading spots can cover the entire whole leafs of potato plants such as the extract of *Sambucus ebulus* L. (*tab. 4*). If in the statements made from a single plant the secondary frequency manifestation was reduced, in the combined extracts, the secondary effects on potato bushes were observed in all variants.

Table 4

**Secondary effects of metabolic extracts on potato plants**

| Var. | The plant from which we performed the extract | The effect on potato plants |
|---|---|---|
| 8 | *Tanacetum vulgare* L. | lowly fading stains and slight yellowing on the leaves of the plant row |
| 10 | *Sambucus ebulus* L. | potato plants stains fade diameter of 1-2mm per 70% foliage, at first they are hard to see, but after about three weeks, appeared golden brown to yellow - green, easily distinguishable |
| 12 | *Tanacetum vulgare* L.+ *Sambucus ebulus* L. | light yellowing of potato bushes (no stains) |
| 13 | *Tanacetum vulgare* L. + *Sambucus ebulus* L. + *Artemisia absinthium* L. | yellowing of potato bushes easier in a first phase, then more pronounced after 3 weeks |
| 14 | *Aconitum vulparia* L.+ *Dryopteris filix-mas* (L.) Schott+ *Tanacetum vulgare*L. + *Stachys sylvatica* L. | slight plant discoloration |
| 15 | *Artemisia absinthium* L.+*Athyrium filix-femina* (L.) Roth | slight yellowing of the plant row |
| 16 | *Aconitum vulparia* L. + *Tanacetum vulgare* L.+ *Sambucus ebulus L.* | bleaching stains on 20% of the foliage with a diameter of 1-2mm |
| 17 | *Tanacetum vulgare L.*+ *Artemisia absinthium*L. | A slight yellowing of the plants row |

## CONCLUSIONS

Bioinsecticides Laser 240 SC, produced a larval mortality of 100% from the first day of application. In the first treatment the product Neem determines an efficacy between 73.5 to 82, 4% (depending on the used dose) and in the second treatment of 81.2 to 84.4%.

The product Milbeknock EC is not recommended in control of the Colorado potato beetle larvae, because determines a very low efficiency (below 20%).

The metabolic extracts have a low metabolic effect on larval mortality, the best results it was obtained for combination *Tanacetum vulgare* L. + *Artemisia absinthium* L. and *Athyrium filix-femina* (L.) Roth.

Some metabolic extracts induce the metabolic inhibition of feeding, because this product not caused damage to leaf area than in a relatively small proportion of up to 10-15% (*Aconitum vulparia*L. + *Tanacetum vulgare* L. + *Sambucus ebulus* L., Aconitum *vulparia* L., *Tanacetum vulgare* L. + *Artemisia absinthium* L., *Athyrium filix-femina* (L.), Roth)

Among phytotoxic effects caused by some metabolic extracts it shows weak trends fade from extract of *Tanacetum vulgare* L., to severe discoloration spots which can cover the entire leaf of potato plants such as when we used the extract from *Sambucus ebulus* L..

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