SOME ASPECTS OF TANK-MIX APPLICATION OF DECIS 2,5 EC AND UREA IN WINTER RAPE

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I. INTRODUCTION

Tank-mix application of pesticides and mineral fertilizers is in recent years more and more preferable in agricultural practice for the tendency of investigation of new more economical technologies. In culture of winter rape there is a special need and possibility to apply insecticides against pollen beetles /Meligethes aeneus F./ and weevils /Ceutorhynchus sp./ in tank-mix with the second or third dose of nitrogen fertilizers in regard to a coincidence in time of these treatments.

There are also laid some hopes to receive an additional fitosanitary effect by an into-leaf application of some mineral fertilizers /Veverka and Oliberius, 1985 ; Nowosielski, 1986 ; Pałosz, in press /.

Before to recommend in practice this method of application it is necessary to carry out a many-sided experimental work on effectiveness, fitotoxicity, emulsion stability, dynamics of disapperance in plants, toxicity to bees and other useful organisms and other properties of such mixtures. The presented work is concerned some of mentioned problems in regard to 0,1 % emulsion of Decis 2,5EC + 10 % of urea /D+U/ compared to 0,1 % emulsion of Decis 2,5EC/D/.

II. MATERIALS AND METHODS

An examination of surface tension /ST/ of emulsions of D and D+U was made by a stalagmometric method. The values were calculated according to the formula :

$$S = \frac{Sw \cdot Nw \cdot d}{N \cdot dw}$$ where :

S - relative ST, Sw - ST of distillated water /= 1,0 /, Nw - number of drops of distillated water, d - density of examinated liquid in g/cm^3, N - number of drops of examinated liquid, dw - density of distillated water in g/cm^3 /=1/

The emulsion stability /ES/ of D and D+U was examinated by an adapted method of biotesting on Musca domestica L. /4-days females/. We have tested equal pipette samples of emulsions from the upper, middle and low part of measuring cylinder /100 cm^3/. The samples were being taken off after 3, 24 and 48 hours from the time the emulsion was made up. The testing was made in Petri-dishes with 1cm^3 of emulsion on upper and low dish and insects were introduced after the liquid was dried up. The evaluation of ES was carried out on the base of LT-50 values according to graphic method of Lietchfield and Wilcoxon /Sliżyński and Lipa, 1973/.

Dynamics of disappearance of insecticidal activity on plants was evaluated on base of LT-50 values using the same method of biotesting on Musca domestica L. Insects were introduced in Petri-dishes with leaves of winter rape previously sprayed with D and D+U on experimental plots. The testing was made in October 1986, 2, 4, 8, 14 and 18 days after treatment. The plants of winter rape /cv Jet Neuf/ were grown on plots in field conditions. For testing were used only freshly picked and not wet leaves.

The field experiment on effectiveness of D and D+U against pollen beetles was carried out in May 1986 on 3-ha crop of winter rape cv. Jet Neuf. For spray was used traditional sprayer Termit with nozzles of high pressure, liquid expenditure - 200 dm^3 on ha and width of spray - 10 m. Effectiveness was evaluated for 2, 5 and 10 days after treatment taking into account the number of living beetles on 4 x 25 plants in each combination.

III. RESULTS AND DISCUSSION

1. Surface tension /ST/

ST is one of the most important physical properties of spray mixtures in plant protection. It is commonly known that liquids with low ST are covering better the suffface of sprayed plants due to more increased dispersion.

Relative ST for D and D+U were as follows :

$$S_D = \frac{1,0 \cdot 15,5 \cdot 1,0}{15,9 \cdot 1,0} = 0,9748$$

$$S_{D+U} = \frac{1,0 \cdot 15,5 \cdot 1,025}{17,3 \cdot 1,0} = 0,9179$$

As it is seen from the calculations the mixture D+U had a little lower ST than D but the difference seems to be too small to have any practical significance. It must be underlined that an addition of Sandovit in recommended dose to D or D+U was equally effective in decreasing of ST. An addition of urea to spray mixture will result in increasing of its specific gravity from 1,0 to 1,025 g/cm^3 and therefore urea may be interpreted as spray charging agent.

2. The rapidity of evaporation /RE/ of spray mixture from leaf surface

As it is known the insecticidal activity is much better when a insect pest is contacting with a spray mixture than with a dry film of evaporated spray on leaves / Pałosz, in press/. There are two factors deciding that RE of D+U is less than that of D. At first it results from Roult's law, that says : the more concentrated is a solution, the more is a decreasing of vapour pressure of dissolvent. At second a phenomenon of higroscopicity has some significance. The critical relative humidity of air /RH/ for urea is 72,5 % /Veverka and Oliberius, 1935/. We have observed for instance that in glasshouse conditions by a high RH /70-85 %/ the drops of D+U on leaves did not drying up even until 48 hours after treatment. In this conditions it has conducted to a phytotoxicity on plants.

3. Emulsion stability /ES/

The results of biotesting of ES are shown on a fig. 1. After 3 and 24 hours the difference in ES between D and D+U wasn't great and a some delay of insecticidal action of D+U confirms the previously stated "disguising" of insecticidal activity in dry deposit of D+U /Pałosz, in press/. In despite of that, LT-50 for low layer of D+U was decreased in comparison to D, what indicates on a process of settlement in emulsion pillar.

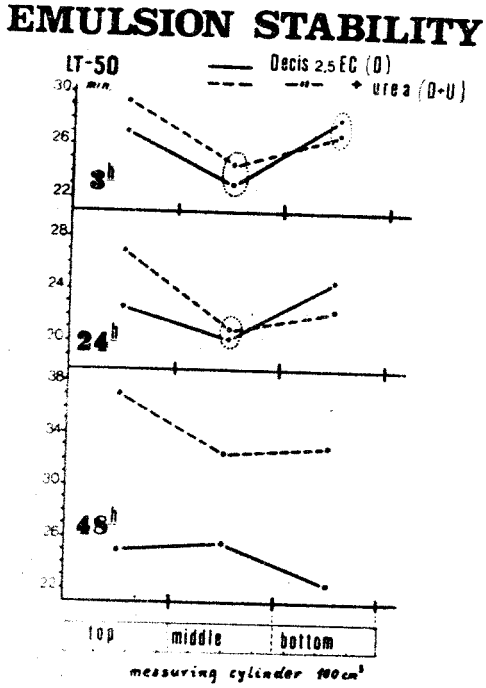

Fig. 1

After 48 hours a process of settlement in emulsion D+U was very clear /the most part of insecticide has probably settled on the bottom of cylinder/ and differences between LT-50 of D and D+U in all layers were statistically significant.

In practice the process of emulsion settlement may be quicker and therefore the immediate using of mixture D+U will be very desirable.

4. Dynamics of disappearance of contact insecticidal activity /CIA/ on plants

Results are shown on fig. 2. Two days after treatment a little quicker CIA has shown D in comparison with D+U. Four days after treatment the difference between D and D+U was statistically non-significant but after 8 days one could state a considerable decrease of CIA. It mainly concerns

D+U but in some degree D too. Supposedly it was caused by a rich rainfall before sample-taking what made us dry out the wet leaves with warm air /possible loss of insecticide/.

In 14 and 18 days after treatment in both variants a progressive decreasing of CIA was happened and the difference between D and D+U was non -significant.

As a conclusion it could be stated that there was no essential difference in dynamics of disappearance of CIA between D and D+U.

DYNAMICS OF DISAPPEARANCE

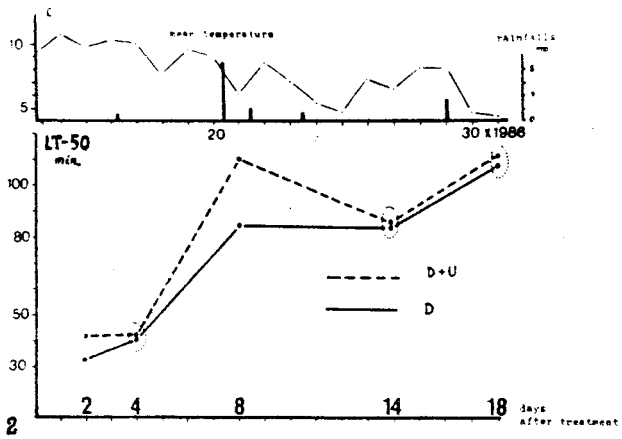

Fig. 2

FIELD EFFECTIVENESS

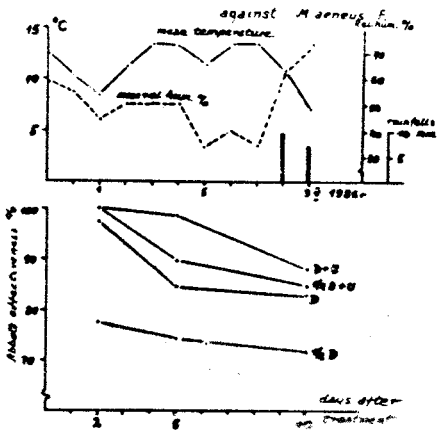

Fig. 3

5. Field effectivenes /FE/ of D and D+U on pollen beetles

Results are shown on fig. 3. The chemical treatment was carried out on 1986-04-29.
Abbott's FE of mixture D+U /even by 50% decreased dose of D/ was higher than of D without urea. It could be supposed that it was caused by a longer contact time of insects with a spray liquid D+U due to its slower degree of evaporation on plants than of D.

The experiment was established by a low infestation of crop by pollen beetles /1,06 - 1,76 beetles on plant in combination without treatment/ and therefore it would be interesant to repeat it in conditions of middle or high infestation.

REFERENCES

1. Nowosielski O., 1986. Florogama /FGO/ - pierwszy nawóz nalistny ochroniarski. Ochrona roślin, 7 : 14-16.

2. Pałosz T., /in press/. Niektóre aspekty stosowania mieszanek insektycydu Decis 2,5 EC z nawozami azotowymi. Prace Naukowe IOR Poznań.

3. Śliżyński K. and Lipa J.J., 1973. Wskazówki metodyczne do wyznaczania średniego czasu zamierania LT-50 w patologii owadów i toksykologii. Prace Naukowe IOR Poznań, XV /1/ : 85-98.

4. Veverka K. and Oliberius J., 1985. Synergistic insecticidal activity of urea and ammonium nitrate. Journal of Plant Diseases and Protection, Stuttgart, 92/3/ : 258-262.