Further information can also be found in the Guidelines for integrated plant protection in oilseed rape cultivation (UFOP).

CROP PROTECTION: INTEGRATED AND OPTIMISED

The EU Commission is planning a significant reduction in crop protection products by 2030 and is increasingly restricting the use of chemical active ingredients. How can this task be fulfilled in the future? Two speakers at the DSV Agriculture Conference in December 2024, organised by Deutsche Saatveredelung AG (DSV), provided answers to this question.

Prof Dr Verena Haberlah-Korr presented innovative approaches from the field of Integrated Crop Protection (ICP) and introduced companion crops as a possible measure.
Wilhelm Wortmann from the Chamber of Agriculture NRW, on the other hand, provides tips on how to optimise your own crop protection application.

OILSEED RAPE COMPANION CROPS IN INTEGRATED CROP PROTECTION

The measures of Integrated Crop Protection (ICP), anchored as a guiding principle in the Plant Protection Act, represent a combination of methods in which the use of chemical crop protection products is limited to a minimum.

Prof Dr Verena Haberlah-Korr, professor at the South Westphalia University of Applied Sciences in Soest in the Department of Agricultural Economics and an expert on ICP in oilseed rape cultivation, used the DSV Agriculture Conference to present the latest results of various research projects. The focus is on four projects in oilseed rape cultivation, which are listed in Table 1.

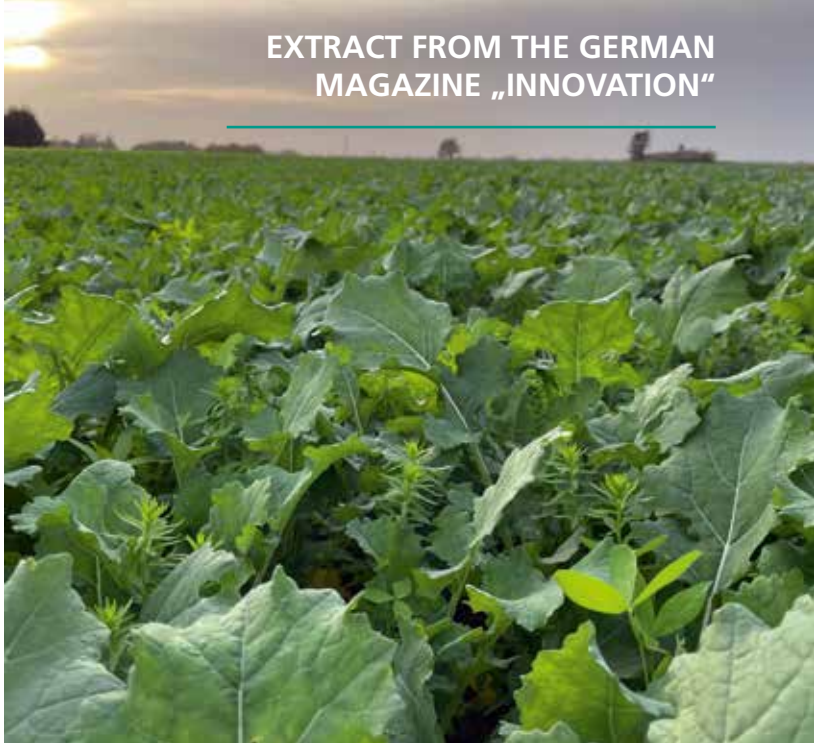
Reduced insecticide use through field inspections

Measures to support damage limitation (see QR code, UFOP guideline), as field inspections in oilseed rape, are an essential part of ICP, but

TAB. 1: RESEARCH PROJECTS PRESENTED

	Project name	Abbreviation
1	Reduction of insecticide use in NRW through integrated crop protection measures in cereals and oilseed rape	**IPSI**
2	Integrated weed control in winter oilseed rape using a hoe or companion crops	**RaBe=Oilseed rape weeds**
3	Oilseed rape cultivation systems with companion crops for defence against insect pests and insecticide reduction	**“Raps-OP” =Oilseed rape sacrificial plants**
4	Effect of herbicides in winter oilseed rape on different companion crops	Phytotox (degree of harmfulness)

Find out more about these projects at: www.fh-swf.de



TAB 2: VARIANTS IN THE „RaBe“ PROJECT

	Variants
1	Control untreated
2	Post-emergence herbicide*
3	Hoe
4	Hoe+ Herbicide post-emergence*
5	Hoe+ Belt sprayer
6	Precision sowing in living mulch (TerraLife® -BrassicaPro 20 kg)
7	Precision sowing in straw mulch
8	Oilseed rape companion crop (TerraLife® -BrassicaPro 20 kg)
9	Soil herbicide

*Belkar Splitting

time-consuming and expensive. The IPSI project (see Table 1) of the South Westphalia University of Applied Sciences in Soest is investigating how damage thresholds can be determined more efficiently and how field inspections be simplified. The project identified an average of 11 field inspections per year, each 21 minutes – overall nearly 4 hours per year. This led to a reduction in insecticide use of 42% with 1.5 treatments compared to the previous standard method with 2.6 treatments. To reduce the effort required for field inspections, Prof Dr Haberlah-Korr recommends digital tools such as the "MagicTrap" – a yellow tray with a camera. This enables pest control via app without having to be on site.

» Companion crops are an exciting tool that can be used to prevent pests and weeds in oilseed rape «

Prof Dr Verena Haberlah-Korr

Companion crops as basic module

Companion crops present another option for reducing the use of crop protection products as part of the preventive measures of the ICP. In Germany, they are not yet as widespread as in England or France, where they are used more frequently due to resistance problems and limited availability of crop protection products. Companion crops offer numerous advantages due to their intensive growth, such as the distraction of insect pests, the suppression of weeds, the promotion of beneficial insects and a positive effect on soil structure.

"Where the ground is covered, fewer weeds grow," says Ms Haberlah-Korr, explaining the simple basic idea behind the project "RaBe". In this two year field trial, the use of companion crops, mulching systems, mechanical methods such as hoeing and, finally, post-emergence herbicides if necessary to control weeds was investigated at four locations in the Soester Börde (see Table 2). No significant differences in yield were found in the results. Prof Dr Haberlah-Korr also presented findings of the "Raps-OP" project: Theoretically, pests should be deterred or lured away from oilseed rape by companion crops as a preventive measure. To this end, a three-year trial was conducted to compare different pest prevention options. This was carried out across 14 locations in North Rhine-Westphalia, Lower Saxony and Mecklenburg-Western Pomerania. The variants are shown in Table 3. It became clear that, depending on the weather, the companion

TAB. 3: VARIANTS IN THE „RAPS-OP“ PROJECT

	Variants
1	Control untreated
2	Customary pure sowing of oilseed rape
3	Addition of 20 % early oilseed rape
4	Addition of 20 % winter turnip rape
5	Addition of false flax
6	Addition 5 kg/ha intercrop mixture*
7	Intercrop mixture edge (yellow mustard, marrowstem kale and turnip rape)
8	Early oilseed rape edge

* White clover, linseed, box horn clover, garden cress, buckwheat

crops developed differently, which led to varying results. The use of false flax and an intercrop mixture proved to be positive. In some cases, false flax was able to reduce the oilseed rape flea larvae just as well as an insecticide. The intercrop mixture, consisting of white clover, linseed, box horn clover, garden cress and buckwheat, partially reduced the weevil infestation. Winter turnip rapes were favoured by the pests and leaf feeding was reduced, but volunteer turnips can be a problem. The oilseed rape yield was mostly the same, sometimes even higher when using companion crops compared to the conventional variant. To summarise, it depends on the weather and the type of companion crop whether pests can be kept out or not. The development and establishment of the companion crops are also decisive.

The herbicide tolerance of oilseed rape companion crops was investigated in the trial "Phytotox – effect of herbicides in winter oilseed rape on different companion crops". The combination of companion crops and herbicides requires a case-by-case decision based on the professor's recommendation. As a result, however, it can be stated with certain limitations that pre-emergence herbicides are the most compatible, false flax, for example. More precise information on this can be found in the article in INNOVATION 01/24 (online at www.magazin-innovation.de).

Prof Dr Haberlah-Korr sees new plant cultivation systems such as companion crops or precision seeding of oilseed rape with the option of hoeing as preventive components of the ICP. She recommends that practitioners use an intelligent combination of these measures before considering the use of crop protection products.

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3 TIPS FOR **BETTER APPLICATION**

Wilhelm Wortmann from the Chamber of Agriculture NRW gave a presentation on selecting the right nozzles and the ideal height of the spray boom to minimise drift.

What's new for application technology in crop protection? „There is a wide range of options in crop protection technology", says Wilhelm Wortmann. He emphasises that there are some very good approaches for making the application and effect of crop protection products more precise and therefore more efficient.

Tip 1

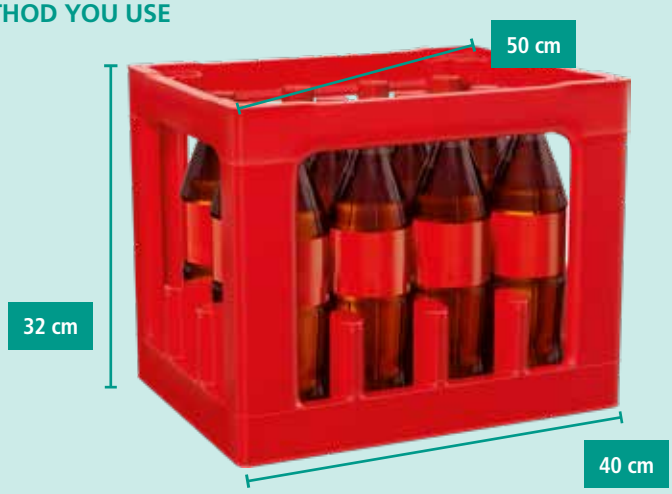
Beverage box for boom calibration

For surface treatments, the nozzles must be aligned so that the entire area is covered and drift is minimised. A boom that is 10 cm too high can cause up to 50 % more drift. The optimum height depends on the nozzle spacing and spray angle:

- 50 cm nozzle spacing, 110–120° spray angle: 40–50 cm height above the target surface.
- 25 cm nozzle spacing, 80–90° spray angle: 35–40 cm height above the target surface.

A simple aid for correctly adjusting the boom is a beverage box. It has almost all the dimensions needed to adjust the boom correctly. The only decisive factor here is how the box is placed under the boom to determine the appropriate distance. Fig. 1

FIG. 1: A BEVERAGE BOX AS A TOOL FOR ADJUSTING THE HEIGHT OF THE BOOM, REGARDLESS OF WHICH APPLICATION METHOD YOU USE



All sizes are combined here: For surface spraying: 40-50 cm (at 110-120°) for which the longitudinal or transverse edge of the box can be used. For spot spraying and band spraying depending on the belt width and nozzle body, the height of the box is used to adjust the boom.

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Fig. 2: Electric single nozzle circuit: The brown nozzle, for example, transports more active ingredient, while the blue nozzle transports less. One example of this is the "AmaSelect CurveControl" technology from Amazone (source: AMAZONEN-WERKE H. DREYER SE & Co. KG).

shows which edges have which dimensions and for which application technique they can be used. A carpenter's pencil provides the appropriate dimensions of 20 to 25 cm for smaller units, which are required for belt spraying methods such as the hoe-belt method.

Tip 2

Curve compensation done right

„The problems arise at the edges," explains Wilhelm Wortmann, describing the challenge of uneven application of crop protection products in the curve area. To solve this problem, there are nozzle control systems that can react flexibly by applying more or less agent as required (electric individual nozzle or spot switching). When driving through a curve, less agent is required in the inner area of the curve as the nozzles move almost on the spot there. In the outer area, on the other hand, the boom moves faster over the surface, so that more active ingredient is required here. Automatic nozzle switching ensures that the application is optimally adapted to the conditions. The crop protection product is metered in such a way that the uneven distribution in the curve is effectively equalised (see Fig. 2). With spot switching, also known as pulsating nozzle technology, on the other hand, the application rate is reduced with just one nozzle if necessary.

Tip 3

Everything about nozzles

„Nozzle advice is not something that can be done on the side," emphasises Wilhelm Wortmann, highlighting the importance and versatility of nozzle selection. In addition to choosing the right nozzle, the correct pressure in bar is also crucial. However, the right choice of application method is important: classic surface or belt spraying or a precision method such as "spot spraying".

- **Spraying methods with varying degrees of efficiency:** The classic spraying methods, belt and surface spraying, have similar efficiency rates according to Wortmann, belt spraying is more cost-effective as less crop protection product is required. A newer method is „spot spraying" (selective treatment). Wortmann reports that a speed of up to 11 km/h is now no problem. This technique can be used as an „online" or „offline" method. The online method uses a built-in camera on the sprayer to detect weeds and then immediately sprays the areas to be treated. A drone with AI weed detection, on the other hand, represents the offline method. The data from the drone image is converted using modern AI methods into a „spot spraying map", which is later used as an application map for spraying. One example is the „Sam Demension" technology. Wortmann was able to confirm in several self-experiments with the offline method on beet fields that this mapping was able to significantly reduce the amount of crop protection products used.

- **The right choice of nozzle:** You can choose between flat spray or double flat spray nozzles. Flat spray nozzles are cheap, but can cause spray shadows, which reduces the centre effect. Double flat spray nozzles minimise this problem, but do not achieve an optimum depth effect. Higher quality but more expensive nozzles of this type have a customised spray angle and coverthe plant better.

- **The right nozzle pressure:** Too high or too low pressure affects the application rate. Rule of thumb: „The pressure depends on the nozzle length". Short nozzles (approx. 2 cm in length) require 2–3 bar, longer nozzles (3–4 cm in length or longer) around 3–5 bar. Wortmann explains the details in his presentation.

Wilhelm Wortmann
Chamber of Agriculture NRW

Conclusion

Integrated crop protection in oilseed rape is a dynamic concept that thrives on innovation and continuous development. New plant cultivation systems such as precision seeding and companion crops promote beneficial organisms and regulate pests and weeds. Modern application techniques such as partial site-specific belt spraying enable considerable savings to be made on herbicides. Prof Dr Verena Haberlah-Korr and Wilhelm Wortmann (Chamber of agriculture NRW) show that precise, targeted work is crucial. A well thought-out, whether through the correct setting of the sprayer boom or choice of the right nozzle, saves crop protection products and money. The combination of different technologies and measures is the key to more sustainable and efficient crop protection.

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