# COMPANION CROPS IN OIL-SEED RAPE – WHICH HERBI-CIDES ARE COMPATIBLE?

There are many reasons for growing companion crops in oilseed rape stands: they increase the biodiversity and humus contents and protect the soil from erosion and are beneficial for insects. Yet, how can growers reconcile the strategy of growing companion plants with that of using herbicides for controlling weeds and oilseed volunteers? To find an answer, the South Westphalia University of Applied Sciences in Soest, Germany researched into companion plant tolerances to herbicides.

Clovers or flax, for example, increase the biodiversity of oilseed rape systems and make the crop less vulnerable to pests and

weeds and also help reduce nutrient deficiencies. Companion crops are sown in autumn either along with oilseed rape or in a separate drilling pass; some are winter-hardy, some die at sub-zero temperatures.



## PHOTO 1: DRONE IMAGE OF THE TRIAL SITE TAKEN ON 13 OCT 2021 OVERLAID BY COMPANION PLANT NAMES AND TEST VARIANT NUMBERING

noto: Philip Deblor

Variant	Herbicides / Sequence of application	Application rate (l/ha)	Date T1-T4	Phytotoxicity (%) determined in the final appraisal on 12 Nov 2021					
				Serradella	Linseed	Niger	Phacelia	Alexandrine Clover	Persian clover
1	Untreated control (coverage %)	0.00		35	40	95	100	30	35
2	Fuego	1.50	T1	40	0	100	85	80	70
	Runway	0.20	T4						
3	Butisan Gold	1.00	T1	10	5	10	30	5	0
4	Butisan Gold	2.00	T2	100	45	95	100	100	100
	Runway	0.20	T2						
5	Angelus	0.33	T1	10	0	5	3	1	0
6	Colzor Trio	4.00	T1	100	95	30	85	75	50
7	Belkar splitting	2 x 0.25	T3 & T4	100	100	100	90	100	100
	Synero	0.25	Т3						
8	Belkar	0.50	T4	60	100	100	90	100	100
	Synero	0.25	T4						
9	Fox	1.00	T4	20	5	100	95	5	3
10	Agil-S	0.75	T2	0	0	0	0	0	0
11	Select 240 EC	0.50	T2	0	0	0	0	0	0
	Radiamix	1.00	T2						

#### TABLE: PHYTOTOXICITY (LEVEL OF ADVERSE EFFECTS) AS DETERMINED IN THE LAST APPRAISAL ON 12 NOVEMBER 21

> 60 % phytotoxicity 10-59 % phytotoxicity 10-10 % phytotoxicity 11: 07 Jun 2021, VA 12: 20 Sep 2021, EC 11-12 13: 27 Sep 2021, EC 14 14: 04 Oct 2021, EC 16

#### Diversity strengthens a crop

Legumes as companion crops (e.g. clover, lupins, field beans) fix additional atmospheric nitrogen and make it available to the oilseed rape. With regard to pest control, some oilseed rape pests such as the cabbage stem flea beetle prefer some companion plants (e.g. buckwheat) to oilseed rape to feed on or they are deterred by the smell of other companion plants (e.g. fenugreek) whereas some companion plants actually hinder them from actually finding the rape plants (such phacelia). Another benefit of companion crops is that they increase the biomass cover which in turn is beneficial for the microorganisms, helps building humus and reducing erosion and at the same time suppresses weeds and grass weeds.

At best, such systems don't require any

#### FIGURE 2: PHYTOTOXICITY (LEVEL OF ADVERSE EFFECTS) OF PRE-EMERGENT HERBICIDES EXPRESSED IN PERCENT. MEASUREMENTS TAKEN 21 DAYS AFTER THE APPLICATION



herbicide application at all. Yet, should it indeed be necessary, to keep cereal volunteers or problematic weeds such as chickweed or blackgrass in check, the best solution would be to use a companion plant that tolerates those herbicides that are typically used in oilseed rape. After all, we don't want to lose these little helpers after we sowed and grew them by investing time and money.

#### An experiment supplies the data

To find an answer, the first trial was set up in autumn 2021 in cooperation with Deutsche Saatveredelung AG (DSV) on the experimental farm of the South Westphalia University of Applied Sciences as a student project work (Anna Kuhne, Lars Frenzel & Christoph Hannes). Nine different companion crops and two mixes (TerraLife® BrassicaPro, TerraLife<sup>®</sup> AguaPro Organic) plus one crop of oilseed rape as a reference crop were sown into separate and adjacent 3m wide plots. Later on, all plots received a fullwidth herbicide treatment at different dates. Photo 1 shows the chessboard-like set-up of the unrepeated trial. The overhead photo was taken more than five weeks after

Fenugreek	Blue lupin	Field bean	Buckwheat	TL Brassica- Pro	TL AquaPro Organic
30	35	95	90	75	100
90	40	100	70	60	70
10	0	0	5	5	5
100	85	100	70	95	95
5	10	0	15	2	1
5	10	2	25	80	55
100	90	100	100	100	90
100	100	100	100	95	80
65	5	40	100	30	70
0	0	0	0	0	5
0	0	0	0	0	5

#### Phytotoxicity (%) determined in the final appraisal on 12 Nov 2021



This trial explored the option of applying chemicals to control weeds and volunteers without decimating welcome companion plants (such as BrassicaPro shown here).

seeding (6 June 2021) and after all the various herbicides had been applied. The photo shows that also in the control plot where no herbicide was applied (variant 1, right and left) some companion plants showed a very poor growth. In fact, sorghum performed so poorly that no data could be collected.

The table lists the various treatment strategies and four different application dates (T1-T4) which related to the growth stage of the surrounding oilseed rape plants. Volunteer oilseed rape and blackgrass became a problem in those plots where no catch crops were grown. Another problem was caused by pigeons, rabbits and deer which appreciated the new diversity in their feed. The first frost in mid-November caused velvet weed and buckwheat to die quickly, and further frosts damaged phacelia.

#### Results

After 7, 14 and 21 days following the chemical application, the companion plants were visually inspected for any damage by the herbicide. Figure 2 shows the level of "phytotoxicity in percent" (phytotoxicity = level of adverse effects) of Fuego, Angelus and Colzor Trio which were applied at the full application rate and of Butisan Gold that was applied at a reduced rate (100 % = 2.5 l/ha).

Pure metazachlor (Fuego) was tolerated well by all companion crops except phacelia (see fig. 2). Although affected by the metazachlor treatment and treated in the Butisan Gold and Angelus variants, phacelia did not die during the frost period, because at that time it was in a less vulnerable stage.

By the time of the final appraisal in mid-November, much of the damaged parts caused by the pre-emergence herbicides had grown out (Table). Adding Runway (var. 4) or repeating Runway (var. 2) however proved to be incompatible for almost all companion crops.

#### Conclusion

The results that were gained at only one location and during one year may not allow us to make a scientific statement yet, but we can give some preliminary advice on herbicide application in oilseed rape that is accompanied by other plants:

• It is not recommended to apply the

growth substances Belkar or Runway.

- The graminicides Agil-S and Select 240 EC are tolerated by companion plants.
- Metazachlor-based herbicides (Fuego and Butisan Gold) are tolerated quite well when applied prior to emergence (not to phacelia). Crops that suffer initial damage by this agent will recover.
- Clomazone solo (Angelus) is tolerated well as a mix in Colzor Trio it is only recommended for field bean, blue lupin and fenugreek.
- The PPO inhibitor Fox is tolerated by Serradella, Linseed, Alexandrine clover, Persian clover and blue lupin.

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