
Sektion 7: Herbizide - Management

Section 7: Herbicide - management

Cruciferous weeds in oil seed rape – appearance and control

Kreuzblütler als Unkräuter im Raps – Aussehen und Kontrolle

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Abstract

Different cruciferous weeds were drilled in autumn 2011 and 2012 in a field near Münster. Beside common species like hedge mustard (*Sisymbrium officinale* Scop.), shepherd's purse (*Capsella bursa-pastoris*), pennycress (*Thlaspi arvense*), tall hedge mustard (*Sisymbrium loeselii*) and flaxweed (*Descurainia sophia*), we tried to establish weeds that are not common on arable land in Germany until now. These were: Yellow rocket (*Barbarea vulgaris*), hoary cress (*Lepidium draba*) and Turkish rocket (*Bunias orientalis*). In autumn 2011 emergence of the sown weeds was poor. In the second year of experiment we got good emergence of the named weeds excluding hoary cress (*Lepidium draba*). In autumn 2011 and 2012 different herbicide-combinations were applied across the stripes. The best results were achieved with Colzor Trio (clomazone + dimethachlor + napropamid) which was applied in pre-emergence state, a spray sequence Butisan Gold (metazachlor + quinmerac + dimethenamid-P) applied in pre-emergence followed by Salsa (ethametsulfuron-methyl) + Trend (adjuvant) in post-emergence and Clearfield-Vantiga (metazachlor + quinmerac + imazamox) + Dash (adjuvant), also applied in post-emergence state of the weeds.

Keywords: Acetolactatsynthase-inhibitors, brassicaceae, chemical control, germination, oil seed rape, outdoor

Zusammenfassung

Im Herbst der Jahre 2011 und 2012 wurden verschiedene Kreuzblütler auf einem Feld in der Nähe von Münster ausgesät. Neben weit verbreiteten Arten wie Wegrauke (*Sisymbrium officinale*), Hirtentäschelkraut (*Capsella bursa-pastoris*), Ackerhellerkraut (*Thlaspi arvense*), Löselkraut (*Sisymbrium loeselii*) und Besenrauke (*Descurainia sophia*), versuchten wir auch Arten zu etablieren, die auf Ackerflächen in Deutschland noch nicht allgemein vertreten sind. Dazu gehörten Barbarakraut (*Barbarea vulgaris*), Pfeilkresse (*Lepidium draba*) und Orientalische Zuckerschote (*Bunias orientalis*). Im Herbst des Jahres 2011 liefen nur wenige Unkräuter auf. Im zweiten Versuchsjahr war mit Ausnahme der Pfeilkresse (*Lepidium draba*) ein guter Aufgang der ausgesäten Unkräuter festzustellen. Quer zu den Unkrautstreifen wurden im Herbst 2011 wie im Herbst 2012 verschiedene Herbizid-Kombinationen ausgebracht. Die besten Ergebnisse konnten mit Colzor Trio, welches im Vorauflauf eingesetzt wurde, einer Spritzfolge aus Butisan Kombi im Vorauflauf, gefolgt von Salsa + Trend im Nachauflauf und Clearfield-Vantiga + Dash, welches auch im Nachauflauf eingesetzt wurde, erzielt werden.

Stichwörter: Acetolactatsynthase-Hemmer, Brassicaceae-Arten, chemische Kontrolle, Freiland, Keimung, Raps

Introduction

The control of cruciferous weeds in the cruciferous crop oil seed rape is a challenge, especially after the active ingredient clomazone has received further restrictions. Due to these restrictions the options of use are severely limited. On the other hand there is a discussion that beside the common cruciferous weeds like *Capsella bursa-pastoris*, *Sisymbrium loeselii*, *Descurainia sophia* and *Thlaspi arvense* further cruciferous plants could become significant competitors. *Barbarea vulgaris*, *Lepidium draba* and *Bunias orientalis* are named in this context. The aim of the project was on one hand to have an intensive look on the growth and appearance of these "new" plants and on the other hand to investigate how they are controlled by oil seed rape herbicides.

Material and Methods

The weed seeds were delivered by the companies "Appels wilde Samen" and "Herbiseed". Further on we got some samples from Dow AgroScience and BASF SE. The drilling took place on 21.09.2011 and 30.08.2012. The seeds were drilled in stripes of 1.3 meter x 50 meter with a "Hege" drilling machine, suitable for trials. Crosswise to the drill stripes the herbicides were applied. In autumn 2011 the first half of the 50 meter long trial, in 2012 the second half. Thus, in autumn 2012 there was germination from seeds that were sown in 2011 as well as in 2012. The drilling depth was 2 cm. In both years the following weeds and seed rates were sown. *Thlaspi arvense* (2.3 g/m²), *Barbarea vulgaris* (1.5 g/m²), *Sisymbrium officinale* (0.75 g/m²), *Sisymbrium loeselii* (0.75 g/m²), *Descurainia sophia* (0.75 g/m²), *Capsella bursa-pastoris* (0.075 g/m²), *Bunias orientalis* (2.3 g/m²), *Raphanus raphanistrum* (0.75 g/m²), *Lepidium draba* (1.5 g/m²), *Sinapsis arvensis* (1.5 g/m²) and *Brassica napus* (1.5 g/m²). Beside these cruciferous weeds other species like *Geranium rotundifolium* (1.5 g/m²) were integrated in the study. The natural weed infestation on the field was a population of *Viola arvensis*, *Matricaria chamomilla*, *Papaver rhoeas* and *Capsella bursa-pastoris*.

The application of the herbicides was carried out with a trial sprayer. The sprayer was equipped with an Airmix 110 03 nozzle. The applications were done with 300 L/ha water and a pressure of 2.3 bar. Beside every application path an untreated control with a width of 30 cm was left. The herbicidal efficacy was finely assessed on 19.04.2013 as % visual biomass reduction.

To control the natural weed infestation we used Stomp Aqua (2.0 L/ha), Kerb Flo (1.0 L/ha) and Runway (0.2 L/ha). This was done in the second year of investigation and worked well for *Viola arvensis*, *Matricaria chamomilla*, *Stellaria media* and *Papaver rhoeas*. This mixture was applied on 22.10.2012.

Tab. 1 List of products used in the period of investigation.

Tab. 1 Aufstellung von Produkten, die im Untersuchungszeitraum zum Einsatz kamen.

Product	Active ingredient(s)	g/L/kg
Colzor Trio	clomazone + dimethachlor + napropamid	30 + 187,5 + 187,5
Butisan Gold	metazachlor + quinmerac + dimethenamid-p	200 + 100 + 200
Centium 36 CS	clomazone	360
Clearfield-Vantiga	metazachlor + quinmerac + imazamox	375 + 125 + 6,25
Butisan Top	metazachlor + quinmerac	375 + 125
Salsa	ethametsulfuron-methyl	750
Runway	aminopyralid + clopyralid + picloram	40 + 240 + 80
Fox	bifenox	480
Stomp Aqua	pendimethalin	455
Kerb Flo	propyzamid	400

Results

In the first year of experiment the germination of the seeds was poor. *Barbarea vulgaris*, *Sisymbrium officinale* and *Bunias orientalis* did occur, but not before March 2012. So it was not possible to estimate the impact of the applied herbicides in this year of investigation. At least the different abilities to compete with other plants could be seen. In May 2012 the weed flora was strongly dominated by *Matricaria chamomilla*. Against this early established weed, *Sisymbrium officinale* and *Bunias orientalis* showed to be competitive. This was not the case for *Barbarea vulgaris* and *Capsella bursa-pastoris*. But in contrast to *Capsella bursa-pastoris*, *Barbarea vulgaris* was able to grow "in the dark" what means, that it was able to grow under the *Matricaria chamomilla* cover.

In the second year a good, equable germination and growth could be observed. This was the case for all named weeds except for *Lepidium draba*. *Lepidium draba* again, only germinated in spring. The impact of the applied herbicides can be seen in the tables below. One has to keep in mind, that there was no crop to support the activity of the herbicides. Not listed are *Raphanus raphanistrum* and *Sinapis arvensis*. The species developed continuously and equal. The growth could be reduced by up to 90% with Clearfield-Vantiga + Dash. The other herbicide treatments showed no significant effect. Even so all plants were killed over winter.

Tab. 2 Impact of different herbicide sprays against cruciferous weeds and *Geranium rotundifolium*.

Tab. 2 Wirkung verschiedener Herbizidanwendungen gegen Kreuzblütler als Unkräuter und *Geranium rotundifolium*.

Application-timing	Product and application rate per ha						
Pre-emergence, 03.09.2012, soil dry, cloudy, 20°C	Colzor Trio 4,0 L	Butisan Gold 2,5 L	Butisan Gold 1,5 L	Centium 36 CS 0,3 L	Butisan Gold 1,5 L + Centium 36 CS 0,3 L		
GS 10-16, 5.10.2012, soil moist, plants dry, sunny, 12°C	Control						Clearfield Vantiga 2,0 L + Dash 1,0 L
Weed	Cover ratio %	% efficacy on 19.04.2013					
<i>Barbarea vulgaris</i>	35	55	35	25	0	25	40
<i>Bunias orientalis</i>	12	60	60	15	20	36	90
<i>Capsella bursa-pastoris</i>	65	98	65	55	65	95	50
<i>Descurainia sophia</i>	10	50	70	50	40	55	80
<i>Sisymbrium löselii</i>	25	100	40	20	90	93	75
<i>Sisymbrium officinale</i>	30	100	20	10	100	100	100
<i>Geranium rotundifolium</i>	80	95	70	40	0	75	50

Tab. 3 Impact of different herbicide sprays against cruciferous weeds and *Geranium rotundifolium*.**Tab. 3** Wirkung verschiedener Herbizidanwendungen gegen Kreuzblütler als Unkräuter und *Geranium rotundifolium*.

Application-timing		Product and application rate per ha					
Pre-emergence, 03.09.2012, soil dry, cloudy, 20°C		Butisan Gold 1,5 L					
GS 10-16, 15.10.2012, soil moist, plants dry, sunny, 12°C	Con- trol	Clearfield	Butisan			Runway	Runway
		Vantiga 2,0 L + Dash 1,0 L	Top 2,0 + Salsa 25 g + Trend 0,3 L	Salsa 25 g + Trend 0,3 L	Salsa 25 g + Trend 0,3 L	Salsa 25 g + Trend 0,3 L	Fox 0,5 L
Weed species	Cover ratio %	% efficacy on 19.04.2013					
<i>Barbarea vulgaris</i>	35	40	25	0	45	30	30
<i>Bunias orientalis</i>	12	90	35	30	45	35	15
<i>Capsella bursa-pastoris</i>	65	50	60	20	95	60	20
<i>Descurainia sophia</i>	10	80	95	100	100	99	80
<i>Sisymbrium löselii</i>	25	75	70	70	87	90	30
<i>Sisymbrium officinale</i>	30	100	75	45	45	50	70
<i>Geranium rotundifolium</i>	80	50	75	55	97	60	30

Discussion

Taking the average, the best weed control was achieved with Colzor Trio. This was also in 2011/12 the case when *Matricaria chamomilla*, *Papaver rhoeas*, *Centaurea cyanus* and *Stellaria media* stood in front. Concerning the "new" weeds, *Barbarea vulgaris* showed to be not that competitive but very persistent and quite tolerant to the applied herbicides. Clearfield-Vantiga + Dash showed considerably activity in late autumn; but without a competitive crop plants recovered. *Bunias orientalis* once germinated, grows rapidly and can reach an impressive dimension. But it seems to be not too winter hardy. There was a loss of about 50% of the plants over winter. This rate was increased through herbicide treatments, even so the herbicide treatment showed no direct effect on the plants. This, for example, was the case after treatment with full rate of Butisan Gold in pre-emergence. Further germination of *Bunias orientalis* was partly controlled in the plots treated with Salsa. A residual activity of ethametsulfuron-methyl, lasting until spring, was visible. This might

explain the good control of *Descurainia sophia* by all Salsa treatments. The sequence of Butisan Gold followed by Salsa produced the best results in case of the Salsa treatments. Full control of *Sisymbrium officinale* was only possible by the use of clomazone products or Clearfield-Vantiga + Dash. None of the used herbicide treatments/systems were able to control all weeds sufficiently. Therefore and keeping in mind resistance developments, it is desirable to preserve as much active ingredients in the market as possible.