

Chemical weed control in oilseed rape

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Winter oilseed rape is primarily spreading in non irrigated areas of Central Italy where it interrupts continuous cereal cropping. Virtually all of the crop is autumn sown and usually follows barley or wheat in the rotation. Therefore the same weed flora which infests cereals also infests oilseed rape. The major grass weeds are *Alopecurus myosuroides* (black-grass), *Avena* spp. (wild oats), *Lolium multiflorum* (Italian ryegrass), *Phalaris brachystachys* (short-spiked canary-grass), *Phalaris paradoxa* (bristle-spiked canary-grass) and volunteer cereals. The most important broad-leaved weeds are *Sinapis arvensis* (wild mustard), *Papaver rhoeas* (common poppy), *Matricaria* spp. (mayweeds), *Anthemis arvensis* (corn chamomile), *Raphanus raphanistrum* (wild radish), *Ranunculus arvensis* (corn buttercup), *Galium aparine* (cleavers), *Fumaria officinalis* (common fumatory) and *Bifora* spp. (coriander). Attention must be given to grass weeds and members of the mustard family because they have the same cycle as the crop and are highly competitive. Furthermore, high densities of wild mustard contaminate harvested rape seed, decreasing oil content (fig. 1) and increasing erucic acid content. Mayweed is chiefly a problem at harvesting time because it is still green. In field experimental trials weed control increased yield by 42 % in comparison with check plots.

It is clear that weed control is one of the most important aspects of oilseed rape production. Chemical weed control must be early in order to avoid noxious early competition and it must assure a weed free crop until quick crop growth in the spring reduces emergence and growth of spring weeds.

Herbicide application timings are: pre-sowing, pre-emergence and post-emergence. Pre-plant incorporated applications present the risk of damaging the seed bed; this is most common in the heavy soils of Central Italy. Pre-emergence treatments are easier than pre-sowing applications. Post-emergence treatments allow a better choice of product than the other treatments and they may be applied at various crop stages but sometimes the distributions may be impossible due to weather conditions.

The Agronomy Institute of the University of Perugia has carried out field experimental trials

since 1980 in order to evaluate activity and selectivity of several herbicides. Results are summarized in Table 1.

On the basis of these results, as well as other sources, it is possible to give some technical information about the herbicides tested.

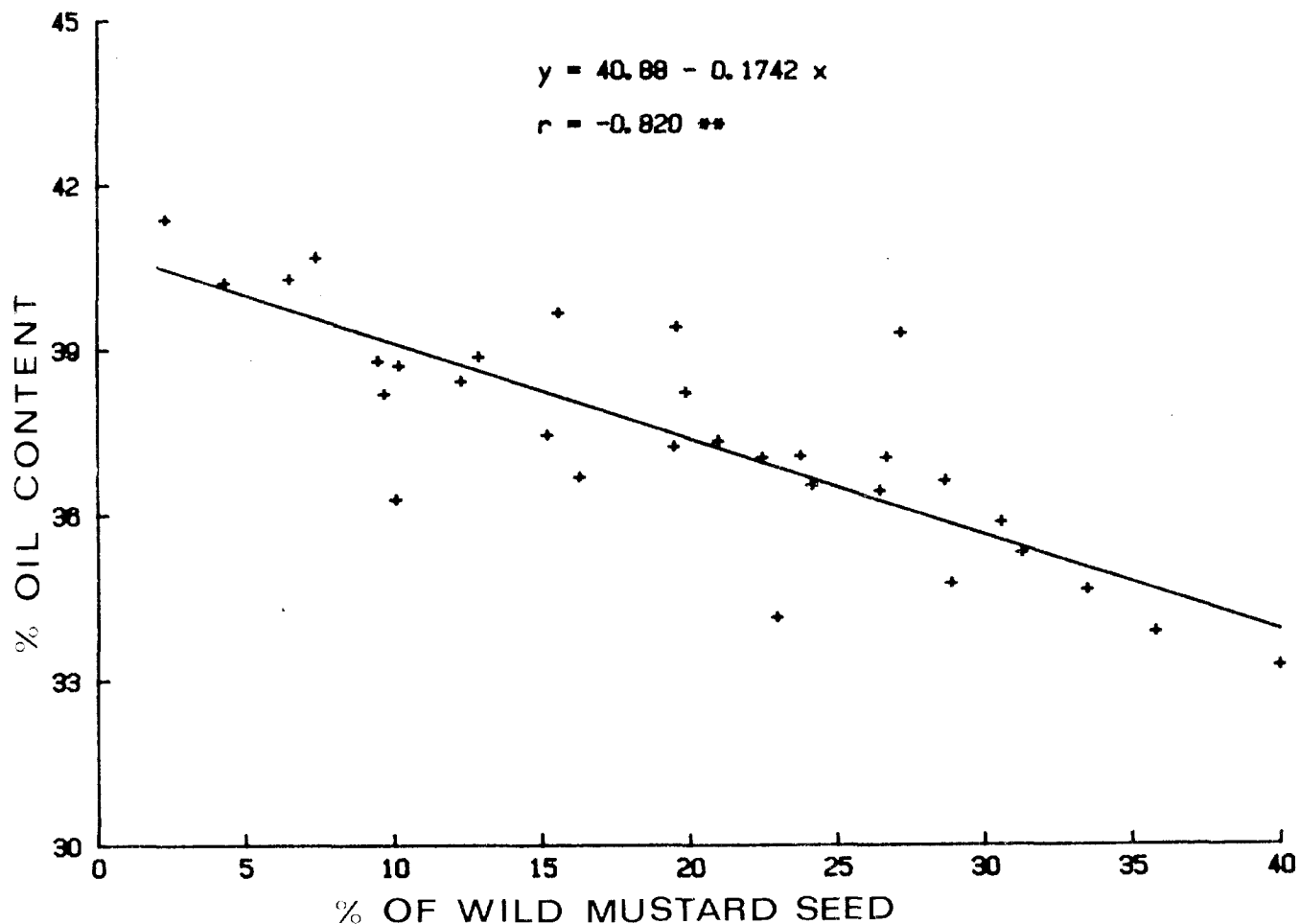
Pre-sowing treatments

- Napropamide (1-1.25 kg a.i./ha) should be incorporated in the top 2-3 cm of soil within 2 days after application. It gives excellent control against grass weeds, volunteer cereals and several broad-leaved weeds but is not satisfactory against mustard family species. It is not always selective.
- Trifluralin (1.15 kg a.i./ha) should be incorporated in the top 5-8 cm of soil. It may be phytotoxic, therefore it would be better to apply and blend into the soil 10-15 days before sowing. It is effective against blackgrass and Italian ryegrass but not completely effective against wild oats and volunteer cereals. It controls common poppy, common fumatory and cleavers but not wild mustard, wild radish, mayweeds and corn chamomile.

Pre-emergence treatments

- Metazachor (0.75-1.25 kg a.i./ha) shows good control of grass weeds but it has variable activity against volunteer cereals. It controls several broad-leaved weeds with the exception of wild radish. In field experimental trials it reduced plant population but yield was not decreased. It can also be used in early post-emergence (2 true leaf stage of the crop) but with lower effectiveness.
- Tebutam (3.24 kg a.i./ha) is effective against annual grass weeds, volunteer cereals, common poppy, common chickweed (*Stellaria media*) and corn chamomile. Mayweeds and speedwells (*Veronica* spp.) are moderately susceptible whereas shepherd's purse (*Capsella bursa-pastoris*), wild mustard, cleavers and common fumatory are resistant.

Figure 1.
Relationship between percentage of wild mustard seed (by weight) and percentage of oil content of rape seed sample.



Post-emergence treatments

— Carbamate + dimefuron (1.75 + 0.88 kg a.i./ha) is used from the 4 true leaf stage of the crop. It gives excellent control against grass weeds, and numerous broad-leaved weeds with the exception of wild mustard. Volunteer cereals are moderately susceptible.

— Clopyralid (0.10-0.12 kg a.i./ha) gives excellent selectivity any stage of the crop. It is a specific herbicide against mayweeds, corn chamomile, thistle (*Cirsium arvense*) and coriander.

— Propyzamide (0.75 kg a.i./ha) can be used from the 2 true leaf stage of the crop. It has slow but excellent control against grass weeds and volunteer cereals. It controls common chickweed and speedwell but gives only partial control of the other dicotyledons. It should be applied when weeds are at early growth stages.

— Propyzamide + clopyralid (0.50 + 0.06 kg a.i./ha) is used from the 2 true leaf stage of the crop. It controls grass weeds, volunteer cereals, mayweeds, corn chamomile, thistle, coriander, common chickweed and speedwell.

— Propyzamide + diuron (0.50-0.16 kg a.i./ha) is applied from the 4 true leaf stage of the crop. It is effective against grass weeds, volunteer cereals, common chickweed and speedwell. Wild mustard and wild radish are moderately susceptible whereas mayweeds, common poppy and cleavers are resistant.

— Alloxym-sodium, sethoxydim and fluzifop-butyl are very selective and have quick and excellent control against all of the grass weeds and volunteer cereals. The rate of active ingredients and adjuvants depends on the species to be controlled and their growth stage. These products can also be used mixed with metazachlor or clopyralid.

To avoid early competition it would be better to use pre-drilling and pre-emergence treatments which provide as complete an action spectrum as possible. Napropamide and tebutam seem to be the most effective with both grass weeds and broad-leaved weeds excluding wild mustard and wild radish. With weed infestation of the mustard family metazachlor seems to give better control even if it is less effective against grass weeds and volunteer cereals. In post-emergence treatments carbetamide +

dimefuron appears to be the chemical with the widest spectrum. With severe grass weed infestation propyzamide doesn't assure the quick elimination of the competition due to very slow activity; therefore newer grass weed herbicides should be used. Clopyralid should only be used against particular broad-leaved weeds (mayweeds, corn chamomile, thistle, coriander...). In Italy only metazachlor, trifluralin, fluazifop-butyl and sethoxydim are authorized at this time.

Table 1.
Chemical weed control in winter oilseed rape from 1980 to 1985 in Central Italy

Active Ingredient	Rate kg a.i./ha	Application Timing ^a	Mean & control of weed species									N° of trials
			Alopecurus Myosuroides	Avena spp.	Lolium multiflorum	Phalaris spp.	Volunteer barley	Volunteer wheat	Papaver rhoeas	Simaps arvensis	Matricaria chamomilla	
NAPROPAMIDE	1.10	PPI	98	94	100	100	91	90	100	71	83	4
TRIFLURALIN	1.15	PPI	100	72	99	100	70	75	100	10	50	3
TEBUTAM	3.24	PRE	100	100	100	100	100	100	93	0	75	2
METAZACHLOR	1.25	PRE	100	100	100	—	88	98	95	86	100	4
CLOPYRALID	0.12	2 True Leaf	0	0	0	0	0	0	0	0	100	1
CLOPYRALID+PROPYZAMIDE	0.06+0.50	"	100	100	100	100	94	100	31	—	100	1
CLOPYRALID+SETHOXYDIM ^b	0.08+0.30	"	100	100	100	100	93	100	0	—	100	1
METAZACHLOR	1.25	"	100	100	85	67	39	14	38	50	100	2
PROPYZAMIDE	0.75	"	100	100	100	100	96	100	60	76	0	2
CARBETAMIDE+DIMEFURON	1.75+0.88	4 true Leaf	100	100	100	100	78	81	78	0	83	2
METAZACHLOR	1.25	"	100	—	—	—	94	—	24	—	100	1
PROPYZAMIDE+DIURON	0.50+/.16	"	96	100	100	100	100	100	23	67		
ALLOXYDIM-SODIUM	0.90	2-4 True Leaf	98	100	100	96	98	100				3
ALLOXYDIM-SODIUM ^c	0.60	"	92	82	100	96	100	99			2	
L-FLAMPROPISOPROPIL	0.60	"	99	100	0	0	0	0				2
DICLOFOP-methyl	0.82	"	72	95	100	96	0	0				2
SETHOXYDIM	0.50	"	100	100	100	100	94	100				2
FLUAZIFOP-BUTYL ^d	0.50	"	100	100	100	100	100	100				2
QUICZALOFOP-ETHYL ^e	0.15	"	100	100	100	100	100	100				2
N° of trials			5	4	2	3	2	2	4	4	1	

^aPPI = pre-plant incorporated; PRE = pre-emergence

^bApplied with 2.5 l/ha mineral oil

^cApplied with 2.0 l/ha mineral oil

^dApplied with 0.75 % v/v non ionic wetter (Agral)

^eApplied with 0.1 % v/vv non ionic wetter (Etdaldyn)



Figure 1.
View of experimental trial on chemical weed control in oilseed rape in Experimental Station of the Agronomy Institute of the University of Perugia
(Photograph : D. Alberati).

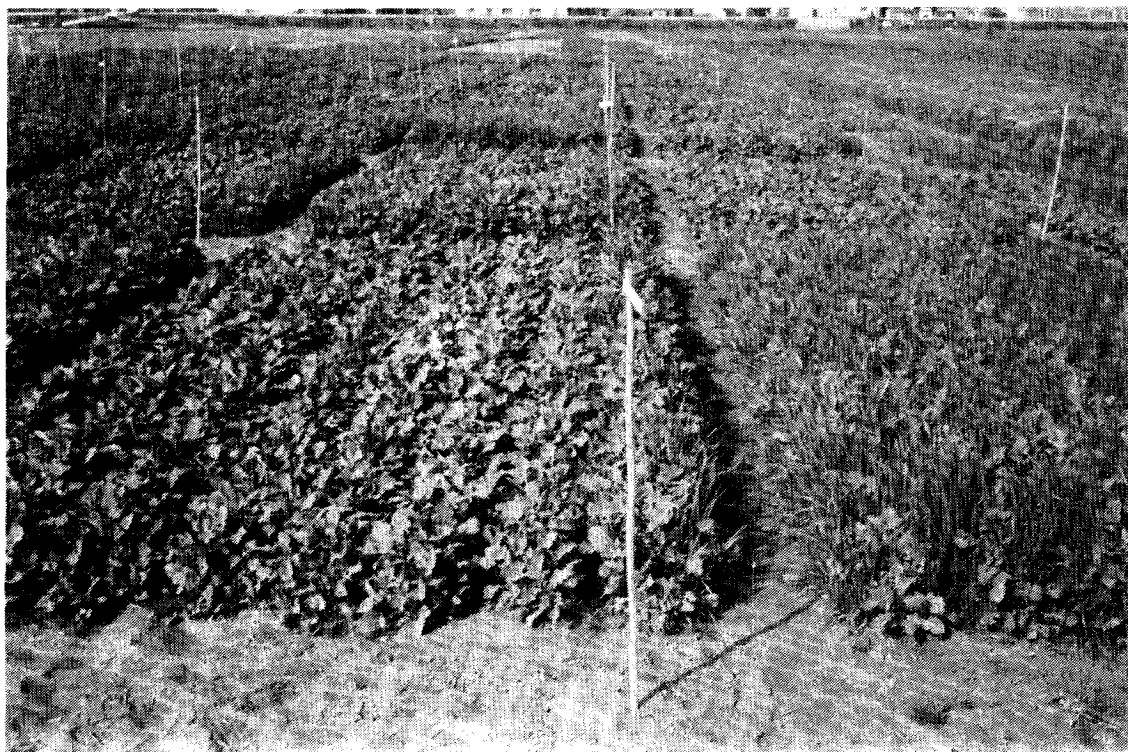


Figure 2.
On the right : check plot; on the left : propamide + diuron.
(Photograph : D. Alberati).