

INTRODUCTION

There is a need in the Northeast to establish cover crops in silage corn. The establishment of cover crops following corn harvest is not practical due to the late growing season. Establishment of cover crops following cultivation is dependent on the weather, soils and the ability of the farmer to cultivate. The establishment of cover crops at time of corn planting has been prevented by incompatibility with commonly used residual pre-emergence herbicides. Now with the use of post emergence, imazethapyr, (IMI) herbicides such as Pursuit and corn hybrids and cover crops resistant to them, this option is now possible. The use of Eradicane preplant incorporated followed up if needed with Buctril can be used to establish alfalfa with conventional corn. Additional low volume herbicides are being tested which will control weeds and temporarily inhibit the cover crops to prevent competition with the corn. Cover crops and herbicides can be managed as a system for identified weed problems.

BENEFITS OF COVER CROPS

- EROSION CONTROL
- REDUCE ASSOCIATED WATER QUALITY PROBLEMS
- INCREASE ORGANIC MATTER
- IMPROVE SOIL STRUCTURE AND TILTH
- FIX ATMOSPHERIC NITROGEN
- RECYCLE UNUSED SOIL NUTRIENTS
- INCREASE SOIL PRODUCTIVITY
- WEED CONTROL

BENEFITS OF SYSTEM

- ESTABLISH COVER CROP EARLY TO BENEFIT FROM ENTIRE GROWING SEASON
- DO NOT NEED TO CULTIVATE TO OBTAIN GOOD SEED BED
- SEED COVER CROPS WHEN THERE IS GOOD SOIL MOISTURE
- CAN USE CONVENTIONAL SEEDING EQUIPMENT FOR UNIFORM AND EFFICIENT APPLICATION OF SEED
- CAN APPLY SEED UNIFORMLY IMMEDIATELY AFTER HARROWING THEN CULTIPACK OR ALLOW RAIN TO WASH SEED INTO SOIL

OBJECTIVES

- TO EVALUATE HERBICIDES FOR COMPATIBILITY TO BOTH CORN AND COVER CROPS
- TO ESTABLISH COVER CROPS AT TIME OF CORN PLANTING
- TO DETERMINE WHICH SPECIES OF COMMONLY USED FORAGE LEGUMES AND GRASSES CAN BE ESTABLISHED UNDER CORN
- TO DETERMINE IF THE INTENDED BENEFITS OF THE COVER
- TO DETERMINE EFFECTS OF COVER CROPS ON CORN YIELDS

Materials and Methods Greenhouse Study

Pot size = 4" diameter X 4" high
Cover crops planted January 11, 1999
5 plants/pot except 4 for birdsfoot trefoil

Species of cover crops: (height and leaf # at spraying)

Red clover 'Randolf' (2.5", 2nd trifoliolate leaf) , **alfalfa** 'Flagship' (2", 2-3 trifoliolate leaf), **perennial ryegrass** 'Palmer II' (8-10" 4 leaf stage), **birdsfoot trefoil**, 'Steadfast' (2-3 trifoliolate leaf)

Soil: Greenhouse Mix of : 33%, sand, silt loam soil and potting mix, pH 6.7 no fertilizer

Post treatments: Feb 18th, 1999, Allen Spray Chamber, Nozzle 8002E, pressure 15 psi. water 20gal/ac. Air temp. 28°C, humidity 75% soil surface damp and firm. NIS @ 0.25% v/v + UAN @ 1qt/ac.

Herbicides: See Table 1

Table 1 Herbicide treatments¹ for Greenhouse Study

Herbicide Treatment	Rate (lb a.i./ac)
flumetsulam (Python 80WDG) Pre	0.04
nicosulfuron (Accent 75DF)	0.03125
imazethapyr (Pursuit 2AS) ²	0.063
rimsulfuron + thifensulfuron (Basis 75df)	0.0104 + 0.0052
halosulfuron (Permit 75%DF)	0.03125
bentazon (Basagran)	1.0
bromoxynil (Buctril)	0.25

¹ Includes Chaser (NIS @ .25% v/v + UAN @ 1qt/ac)

² Pursuit was also used in combination with the last 4 herbicides on the list

Results Greenhouse Herbicide Study

Preliminary screening from the spray chamber greenhouse study (Table 2&3) indicates that Pursuit and Python is usable on all cover crops. The Python is more phyto- toxic and results in some stunting and slowing of germination. This may aid in reducing the competition from the cover crops on the corn crop. Permit is usable on perennial rye grass (PRG) and birdsfoot trefoil (BFT). Accent is usable on BFT and alfalfa (ALF). Basis is not usable on any of the cover crops. Basagran is usable on all cover crops except BFT. Buctril is usable on PRG and ALF and with some stunting on red clover. Figure 1 shows the use of Pursuit and Buctril on red clover.

Table 2 Greenhouse Study Herbicide Effects on Red Clover and Alfalfa

	RC		ALF	
	% Survival	gm/pot	% Survival	gm/pot
Python 80 WDG (flumetsulam) Pre	100	100	.82	1.51
Accent 75DF (nicosulfuron)	46	90	.15	.44
Pursuit 2AS (imazethapyr)	100	96	3.22	2.80
Basis 75DF (rimsulfuron & thifensulfuron)	20	0	.03	0.00
Permit 75% DF (halosulfuron)	20	50	.24	.80
Basagran (bentazon)	100	96	2.50	1.44
Buctril (bromoxynil)	40	90	1.30	1.87
Pursuit + Permit	50	66	.16	1.27
Pursuit + Basagran	100	86	3.53	1.75
Pursuit + Buctril	46	100	.54	2.11
Check	100	100	4.95	3.54
LSD _{.05}	22.0	29	.67	.70

Table 3 Greenhouse Study Herbicide Effects on Perennial Ryegrass and Birdsfoot trefoil

	PRG		BFT	
	% Survival	gm/pot	% Survival	gm/pot
Python 80 WDG (flumetsulam) Pre	100	67.5	3.55	.12
Accent 75DF (nicosulfuron)	6	82.5	0.00	.87
Pursuit 2AS (imazethapyr)	86	82.5	1.02	1.56
Basis 75DF (rimsulfuron & thifensulfuron)	26	75.0	.14	.28
Permit 75% DF (halosulfuron)	100	75.0	2.24	1.26
Basagran (bentazon)	96	0.0	3.63	0.00
Buctril (bromoxynil)	96	70.0	1.13	.45
Pursuit + Permit	96	95.0	1.32	1.10
Pursuit + Basagran	100	0.0	1.40	0.00
Pursuit + Buctril	90	56.0	1.14	.40
Check	100	100.0	3.18	1.69
LSD _{.05}	26	29.3	1.01	.31

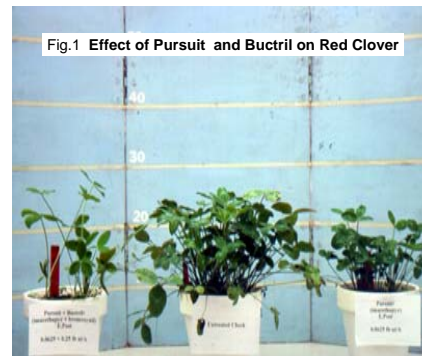


Fig.1 Effect of Pursuit and Buctril on Red Clover

Materials and Methods Big Flats PMC Field Trials

To compare 5 species of cover crops grown with a post emergence spray of Pursuit.

Garst 8570IT 107 day IMI resistant corn was planted on 5/31/98 on a Unadilla silt loam soil at Big Flats NY. A final stand of 25,000 plants /ac. was obtained. 200 lbs/ac of 10-20-20 fertilizer was applied through the planter and 300 lbs/ac of 34-0-0 fertilizer was broadcast spread on 6/11/98. Pursuit 2as was sprayed on 6/29/98 at a 4oz/ac rate with a NIS surfactant .25% v/v. The legumes were at the 2 trifoliolate leaf stage (fig. 2) and the weeds were 2-3 inches tall.

Cover crops were hand broadcast following harrowing the cover crops and their rates were:

Red clover 'Arlington' 10 lbs/ac, birdsfoot trefoil 'Empire' 10 lbs/ac, alfalfa 'Flagship' 15 lbs/ac, perennial ryegrass 'PalmerII' 15 lbs/ac, and orchard grass 'Pennlate' 15 lbs/ac.

Results Field Trial at Big Flats PMC

All of the cover crops had excellent establishment with the broadcast application of seed in freshly harrowed conditions. The legumes had excellent tolerance of the Pursuit herbicide (fig. 3), the perennial ryegrass was stunted and had some mortality, and the orchardgrass was killed. The orchardgrass was smaller than the perennial ryegrass when sprayed which attributed to its lack of tolerance. Weed control was excellent. The cover crops had 50-83.8 % cover in November. All legumes had 100% cover by May 1, 1999. Overall the corn yields were low due to late planting, low population and dry growing conditions in July and August. Although the control yielded .5 tons/ac more than the red clover the corn yields were not statistically different (Table 4).

Table 4 Corn Yields and % Cover Crops at Big Flats PMC

TREATMENT ¹	(11/10/98) % COVER	(9/24/98) CORN YIELD ²
Red Clover	83.8	15.0
Birdsfoot trefoil	61.3	13.1
Alfalfa	71.7	14.7
Perennial ryegrass	50.0	13.8
Control	3.0	15.5

¹ Post emergent spray of Pursuit on 6/29/98, all cover crop seed was broadcast onto soil surface following harrowing with no cultipacking 5/31/98

² Corn silage yield T/Ac calculated at 35% dry matter, LSD_{.05} = 4.6



Fig.2 Size of seedlings when sprayed with Pursuit



Fig.3 Size of seedlings 2 weeks after spraying with Pursuit

Materials and Methods off Center Trials

In 1999 three sites were planted to cover crops using a grain drill. All sites used a pre-plant incorporated treatment of Eradicane at 5 pints/ac and Python at .8 oz/ac.

Cornell T&R Center planted on 5/12/99 on Howard gravelly silt loam,
Corn: Hystest 7224 90 day corn, 10 gal/ac Nitran fertilizer at planting with a 35,000 corn population. No top dressing was done. Force 3g insecticide and Kernel guard supreme was used.

Cover crops: red clover 'Robust' 12 lbs/ac and alfalfa Mycogen 4355 LH at 20 lbs/ac.

Morrisville Ag. & Tech. Planted on 5/12/99 on Conesus silt loam,
Corn: Pioneer 37J99IR 107 day corn, 100 lbs/ac 19-19-19 at planting with a 30,000 corn population. Top dressed when the corn was approximately 1ft tall with Nitran 145 lbs/ac N and 720 lbs/ac 0-16-39. Counter insecticide was used.

Cover crops: red clover 'Pennscott' 6.5 lbs/ac, alfalfa 'ABT205 12 lbs/ac and birdsfoot trefoil 'Norcen'.

Schmidt Farm Planted on 5/17/99 on Chenango channery silt loam
Corn: Pioneer 37J99IR 107 day corn, 250 lbs/ac 19-19-19 at planting with a 29,000 corn population. No top dressing was done. Force 3g insecticide was used.

Cover crops: red clover 'Robust' 8 lbs/ac



Fig. 5 Alfalfa Cover Crop 5/17

Results Off Center Field Trials

At the Cornell farm the alfalfa plot yielded higher than the control. At the Schmidt farm the red clover out yielded the control and at the Morrisville farm the red clover was only .1 ton/ac less than the control. At Morrisville there was a 12.5% reduction in yield due to alfalfa (Table 5). There were 40% more alfalfa seedlings at Morrisville (18.7/ft²) than at Cornell which may explain the reduced yields. All covers provided excellent cover for the late fall 50-75% and between 75-100% cover by early May (Fig. 4 & 5). Problems with ragweed and nutsedge have been seen with the Eradicane Python treatment in the field. Pursuit alone is not very effective on ragweed and lambsquarters. The use of Python, Buctril and Basagran in combination with Pursuit may be needed depending on identified weed problems.



Table 5 Off Center Field Trial Corn Yields 1999

	Control	Red clover	Alfalfa	Birdsfoot trefoil
Schmidt	14.4 t/ac ¹	15.3 t/ac	————	————
Cornell	14.0 t/ac	13.3 t/ac	14.3 t/ac	————
Morrisville	12.8 t/ac	12.7 t/ac	11.2 t/ac	12.2 t/ac

¹ 35% dry matter yields of corn silage



Fig. 4 Alfalfa Cover Crop 11/24