

Cover Crops at the Pullman Plant Materials Center

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1935 - 1940S

- Extensive evaluation of yellow sweet clover
 - in alternate row grass plantings
 - as green manure crop



1980s and 90s

Agronomy Tech Notes

- No. 2 Winter Cover Crops for Irrigated Sandy Soils in the Columbia Basin
- No. 8 Late Fall Seeded Cover Crop Trials
- No. 9 Management of Residual Nitrogen with Cover Crops
- No. 11 Wind Erosion Control in Washington Potatoes

2005



- Plant Materials Tech Note 14: Conservation Cover Technology
 - Section 14.1 Principal Uses of Cover Crops and Green Manures
 - Reviews terminology and considerations of cover crops
 - Provides ranking of cover crops for various purposes

Your main Purpose for using a cover crop

Species Ranking for the Columbia Basin

Legume N Source

1. Hairy vetch
2. Crimson clover

N Scavenger

1. Triticale, Sorghum-Sudan
2. Winter wheat, Annual ryegrass, Oats

Build Soil Quality

1. Annual ryegrass, Triticale, Sorghum-Sudan, Sweet clover
2. Winter Wheat,
3. Hairy vetch, Mustard

Erosion Control

1. Annual ryegrass, Winter wheat, Sorghum-Sudan
2. Triticale, Oats, Crimson clover, Hairy Vetch, Sweet clover

Loosen Sub-soil

1. Sorghum-Sudan, Sweet clover

Suppress Weeds

1. Buckwheat, Triticale, Oats
2. Annual ryegrass, Winter wheat, Sorghum-Sudan, Hairy vetch, Sweet clover

Suppress disease/nematodes

1. Mustard, Sorghum-Sudangrass

Grazing

1. Triticale
2. Winter wheat, Annual ryegrass

2005

- Section 14.2 Conservation Covers for Vineyards and Orchards
 - Summarizes 6 year study evaluating 15 grasses in Benton County, Oregon vineyard
 - Describes grasses in study



Comparison of 15 grass covers evaluated at a Benton County, Oregon vineyard from 1986-1991.

Cultivar	'86 ¹ Stand	----- 1988 -----				----- 1991 -----				Culm Ht (in)	Vigor ²		Traffic ² Tolerance	Rodent ³ Activity
		Veg. Cover	Bare Soil	Weeds (%)	Leaf Litter	Veg. Cover	Bare Soil	Weeds (%)	Leaf Litter		'87	'91		
Covar	VG	31	16	9	43	38	9	48	4	16	5	7	4	low
Pomar	E	25	34	7	35	40	9	46	5	18	4	5	3	low
CBS II	F	26	34	4	36	22	13	60	4	14	4	8	2	high
Mechlenberg	G	45	15	2	39	89	2	3	6	10	3	1	3	low
Zorro	VG	14	13	11	61	12	16	61	11	15	9	8	5	high
Ensylva	F	23	33	4	40	41	7	45	7	17	3	6	4	med
Elka	F	29	32	2	37	14	15	66	5	13	3	8	3	low
Shadow	G	37	9	2	52	68	3	16	10	24	4	3	2	low
Pennlawn	VG	35	7	0	58	76	2	10	12	24	4	2	2	low
Dorado	F	40	16	3	41	78	2	13	7	21	4	3	4	low
Aurora	G	33	15	5	47	59	11	19	11	18	5	4	3	low
Durar	G	25	19	6	52	36	17	39	17	20	5	5	4	med
Elka + Aurora	F	29	33	4	33	54	13	25	8	--	--	4	3	med
Elka + Covar	F	31	29	4	36	31	12	45	11	--	--	5	3	med
Elka + Ensylva	F	26	40	2	34	36	18	27	19	--	--	4	4	low

- 1 E= 90-100% stand, VG= 85-90%, G= 80-85%, F= 70-80%
- 2 1= Excellent, 9= Very poor
- 3 1991 ratings LOW = activity in 0-25% of the plots
MED = activity in 25-50% of the plots
HIGH= activity in 50-100% of the plots

2005

- Section 14.2 Conservation Covers for Vineyards and Orchards
 - Summarizes 1st-year data of Dr. Granatstein's Orchard Floor Experiment

<u>Living Mulch</u>	<u>% Cover, 100 days after planting</u>
Grass	
Colonial Bent grass <i>A. tenuis</i>	88
Carpet type ground covers	
Sweet Alyssum <i>L.maritima</i>	77
Sweet Woodruff <i>G.odoratum</i>	47
Creeping Thyme <i>T. praecox minus</i>	35
Irish Moss <i>S. subulata</i>	37
Native Beach Strawberry <i>F. chiloensis</i>	33
Native Ginger <i>A. caudatum</i>	1
Clovers	
<i>T.repens</i> 'Dutch'	84
<i>T.repens</i> 'NZ'	84
<i>T.repens</i> 'NZ'/ <i>T.fragiferum</i> mix	78
<i>T.fragiferum</i> 'O' Connor's'	55
<i>T.ambiguum</i> 'Prairie'	8
<i>T.ambiguum</i> 'Rhizo'	8
Subclovers	
<i>T. subterraneum</i> 'Antas'	7
<i>T. subterraneum</i> 'Howard', 'Mt. Baker' and 'Tallarook' /mix	32
<i>T. subterraneum</i> 'Clare', 'Nungarin'/Mix	27
Medics	
<i>M. lupulina</i> PI 260980 Afghanistan	47
<i>M. polymorpha</i> 'Santiago'	8
<i>M. lupulina</i> PI 251150 Yugoslavia	43
<i>M. polymorpha</i> 'Serena'	12
<i>M. polymorpha/scutellata</i> Mix	5
Birdsfoot Trefoil	
<i>L. corniculatus</i> 'Norcen'	57
<i>L. corniculatus</i> 'Kalo'	43

2009

- Plant Materials Tech Note 18: Green Manure and Cover Crops for the Inland Pacific Northwest
 - Provides links to cover crop resources:
 - Andy McGuire's information
 - ATTRA
 - Mercy Olmstead's bulletin



Photo: Andy McGuire

2009

● Poster: Partial List of Green Manure and Cover Crops for the Pacific Northwest

Pullman Plant Materials Center



Finding Vegetative Solutions to Conservation Problems

Partial List of Green Manure and Cover Crops for the Pacific Northwest

Green manure and cover crops are planted to protect soil from water and wind erosion, improve soil organic matter and structure, enhance soil microbial activity, supply or scavenge nutrients, suppress nematodes and soil-borne diseases, suppress weeds, and loosen subsurface soil layers. Cover crops can be harvested, grazed, or left standing to provide pollinator and wildlife habitat. Green manure crops are cover crops that are incorporated into the soil prior to planting the primary crop. Mixtures of two or more cover crops (i.e. grasses and legumes) are often more effective than planting a single species.

Crop**	Base of Life to Plant at Day	Here Seed Seeding Rate (lb/Ac) (lb/100)	Seeding Season Spring/Fall	Flower to Harvest Good	Growth Type Med. tall bunch	Nutrient Requirement Moderate	Weed Suppression Excellent	Short-term Pasture Yes	Leaf Uses Hay/Feed, grain	Can be mixed with Annual legumes and grasses	Value Attributes
Clover, Bessem	Requires inoculation*	6-20	Spring	Fair	Succulent vine	Low	Excellent	Yes	Hay, silage, seed	Annual grasses	Prevents erosion, scavenges excess nutrients, adds organic matter, serves as nurse crop, can be used as winter killed cover
Clover, Subterranean Buckwheat	Requires inoculation*	10-30	Spring	Good	Low-growing vine	Low	Excellent	Yes	Forage	Other clovers, perennial grasses	Provides nitrogen, stabilizes soil, serves as nurse crop for annual or companion crop with oak, attracts pollinators and other beneficial insects
Chicpea	Requires inoculation*	30-50	Spring	Poor	Broad leaf	Low	Good	No	Grain	Sorghum, hybrid	Provides nitrogen, stabilizes soil, serves as nurse crop, attracts pollinators and other beneficial insects, lowers topsoil temperatures in winter by 3-4°
Lentils, Spring	Requires inoculation*	40-60	Spring	Good	Succulent vine	Low	Poor	No	Stable legume, seed	Annual grasses	Provides nitrogen, good rotational crop
Lentils, Winter	Requires inoculation*	40-60	Fall	Good	Succulent vine	Low	Poor	No	Stable legume, seed	Annual grasses	Provides nitrogen, good rotational crop
Medic, Black, Bar or Beni	Difficult to require inoculation*	6-26	Spring	Good	Succulent vine	Low	Good	Yes	Forage hay	Clovers, grasses, all grain	Provides nitrogen, can be substituted for timothy, builds soil, controls erosion, re-seeds annuals or perennials
Mustard, Yellow or Brown Calt*	Requires inoculation*	4-12	Spring or Summer	Good	Broad leaf	Moderate	Good	No	Condiment, forage in fall	Other mustards	Breaks up hardpan, tightens soil
Pea, Ayrshire	Requires inoculation*	60-140	Fall	Good	Med. tall bunch	Low	Excellent	Yes	Hay, forage, feed, grain	Annual legumes	Prevents erosion, scavenges excess nutrients, adds biomass, serves as nurse crop, can be used as winter killed cover
Pea, Spring	Requires inoculation*	50-100	Spring	Good	Succulent vine	Low	Good	Yes	Stable legume, forage, hay	Annual grasses	Provides nitrogen, provides nectar for pollinators and other beneficial insects
Repeated, Spring	Requires inoculation*	4-12	Spring	Good	Broad leaf	Moderate	Good	No	Industrial oil	None	Breaks up hardpan, tightens soil
Repeated, Winter	Requires inoculation*	4-12	Fall	Good	Broad leaf	Moderate	Good	No	Industrial oil	None	Breaks up hardpan, produces large amount of biomass, tightens soil
Rye**	Requires inoculation*	60-120	Spring or Fall	Very good	Tall bunch	Low	Excellent	Yes	Hay, forage, feed	Annual legumes and grasses	Regenerates soil, prevents erosion, tightens soil, scavenges excess nutrients, adds organic matter, serves as nurse crop
Sorghum, Subtropical Hybrid	Requires inoculation*	15-30	Spring or Summer	Poor	Tall bunch	High	Excellent	Yes	Forage grain	Bud wheat	Produces large amount of biomass, regenerates soil, lowers soil pH, tightens soil, adds biomass, is most effective when mowed once during growing season
Triticale	Requires inoculation*	70-90	Spring or Fall	Very good	Med. tall bunch	Moderate	Excellent	Yes	Forage hay grain	Annual legumes and grasses	Regenerates soil, prevents erosion, tightens soil, scavenges excess nutrients, adds organic matter, serves as nurse crop
Tumpe	Requires inoculation*	2-3	Spring or Summer	Good	Short bunch	Low	Good	Yes	Forage	Annual and perennial grasses	Provides excellent short term forage, can be inter-seeded into existing pasture
Sweetclover, Yellow or White	Requires inoculation*	6-20	Spring or Fall	Good	Succulent vine	Low	Poor first year, good second	Yes	Forage hay silage	Small grain	Biennial, serves as annual or winter annual, provides nitrogen, scavenges nutrients, adds biomass, prevents erosion, attracts pollinators and other beneficial insects
Vetch, Hairy	Requires inoculation*	20-40	Spring or Summer	Good	Succulent vine	Low	Good	Yes	Forage	Annual and perennial grasses	Provides nitrogen, and forage topsoil
Vetch, Untreated	Requires inoculation*	10-40	Spring or Fall	Good	Succulent vine	Low	Good	Yes	Forage hay seed	Other legumes, grasses	Provides nitrogen, prevents erosion, adds organic matter, attracts pollinators and other beneficial insects

* inoculation with appropriate bacteria is required to enable the plant to produce nitrogen. (inoculation not necessary if a legume has been grown on the field within the last three years.)
 ** No mowing or grazing following seeding or sowing should be required by five weeks due to chemical control by plants that inhibit seed germination (yes/no) can be evaluated separately.
 *** The compound used in the Columbia Basin due to problems with contamination of wheat fields.

10/12/2004

Revised by K. McGuire, WSU Extension



2011

- Future involvement of Pullman Plant Materials Center
 - Assist in selecting additional species for evaluation
 - Assimilate agronomic data
 - Assist in designing, implementing and evaluating on-farm trials



Limited by:

- Staff
- Distance
- Travel budget

2011

Where do we go from here???

- Cover Crop Database
- Selection of additional plant material to evaluate
- Cover Crop Working Group
- What are your needs and concerns?

