

PROGRESS REPORT: Organic Cropping Research for the Northwest

TITLE: Understory Management in Organic Tree Fruits

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2. Living Mulch (LM) trial. The 2004 Living Mulch screening was monitored for a second season; stand cover, competition with weeds, height, bloom dates, and visual signs of rodent attractiveness were monitored and select biomass samples were taken in both year 1 and 2. Winter hardiness and reseeding ability of annuals were also monitored in Year 2. Tree growth parameters were not measured. Plots were mowed for supplemental weed control. In 2005, a second screening was established in a new Pinata/M7 apple block in transition to organic certification, where trees are more sensitive to competition and potential vole damage, and increased sunlight is available to the cover species during establishment. Selected species were planted as "Living Mulch" filling the 150cm wide understory weed strip, or as a 45cm "Sandwich" in the tree line with adjacent tillage in the remaining weed strip. Entries included both perennial landscape species and various legumes and non-legumes. Seedling emergence, stand establishment, % cover (LM and weeds), peak stand biomass and height were measured. Flowering dates and seed production were observed. Plots were mowed for supplemental weed control.

2. Living mulch (LM) trial. Weed pressure was severe. Sweet woodruff was the best performing perennial landscape type LM entry and provided early and season-long cover up to 90% by April. Year 2 growth of scotch moss, creeping thyme, and native beach strawberry was again too slow to suppress weeds. Bentgrass also provided complete early cover, out-competing both weeds and legumes planted as a mix; the grass likely competes with tree growth (Table 2). **Spring planted** alyssum, subclovers and burr medics did not re-establish stands in Year 2; heavy shade and duff contributed to low germination rate. Black medics had a biennial habit; the Afghanistan selection overwintered well and provided the earliest cover of the spring planted legume entries. White clover had better persistence than strawberry clover. Birdsfoot trefoils also performed well; low vigor kura clover failed to establish well in either year. **Fall planted** subclovers, birdsfoot trefoils, black medic (Afghanistan), and kura clover all over-wintered well. Mt. Barker subclover provided early spring cover of up to 70%. All varieties flowered, produced seed and died back in 2005. Fall planted burr medics and the Yugoslavian black medic did not survive the winter. Evidence of stripped stems indicated vole feeding; it is unknown if vole damage or lack of hardiness was the cause of mortality. **Vole trails** were mapped in March to observe winter damage. Trails were concentrated in Rep 1 white clover and bentgrass plots; the clovers showed heavy feeding activity while bentgrass appeared to provide cover rather than food. There was no evidence of vole damage to tree bark.

Expanded screening 2005. Overall, entries seeded in 2005 outperformed the 2004 screening, probably a result of improved light and irrigation and/or earlier planting date in the new block. Entries are listed in Table 3. Stand establishment was excellent for most species. Annual and biennial legumes, white clover, alyssum, and Norcen birdsfoot trefoil (BFT) exceeded 70% stand cover by six weeks post planting (Table 4). Bentgrass, Five spot and Canadian and South American BFTs ranged from 53-67% cover; kura clover and seeded thyme had low vigor. The quickly established annuals, particularly medics, had lower % weed cover. The medics and subclovers produced viable seed; fall emergence was present for all varieties. Perennial landscape entries performed variably. Thyme had significantly higher cover (93%) and lower weed cover (7%) at 6 weeks than other entries. Phlox and woodruff also established cover quickly; mint did not survive. Weed pressure was severe at this site. Cover crop and weed competition were detrimental to tree establishment and growth.

Table 2. Percent cover potential in second year, LM trial (planted 2004).*

2004 Entry	Scientific name	YR 2 % Cover LM -- 3/31/05	YR 2 % Cover LM -- 6/15/05
Perennial Landscape* LM			
Sweet woodruff	<i>Galium odoratum</i>	95	90
Scotch/Irish moss	<i>Sagina subulata</i>	35	55
Creeping thyme	<i>Thymus praecox minus</i>	35	45
Native beach strawberry	<i>Fragaria chiloensis</i>	35	40
Spring Seeded** LM			
Bentgrass, Colonial	<i>Agrostis tenuis</i>	93	78
White clover, Dutch	<i>Trifolium repens</i>	53	73
Black medic, Afghanistan	<i>Medicago lupulina</i>	50	73
White clover, New Zealand	<i>Trifolium repens</i>	47	90
Birdsfoot trefoil, Norcen	<i>Lotus corniculatus</i>	38	72
Strawberry clover	<i>Trifolium fragiferum</i>	35	75
Birdsfoot trefoil, Kalo	<i>Lotus corniculatus</i>	27	70
Black medic, Yugoslavia	<i>Medicago lupulina</i>	10	33
Kura clover, Prairie	<i>Trifolium ambiguum</i>	5	17
Kura clover, Rhizo	<i>Trifolium ambiguum</i>	2	12
Fall Seeded** LM			
Subclover, Mt. Barker	<i>Trifolium subterraneum</i>	72	5
Subclover, Antas	<i>Trifolium subterraneum</i>	40	5
Subclover, Clare	<i>Trifolium subterraneum</i>	30	5
Subclover, Nungarin	<i>Trifolium subterraneum</i>	50	5
Birdsfoot trefoil, all	<i>Lotus corniculatus</i>	50	20
Black medic, Afghanistan	<i>Medicago lupulina</i>	15	15

* Best results

** Average of three reps

Table 3. Living Mulch screening entries planted in 2005

Common Name	Scientific name	Variety or Location	Life Cycle	System	Planting
Non-Legume Species					
Corsican mint	<i>Mentha requienii</i>	Corsican	Perennial	SW	Plugs
Bearberry, Kinnikinnick	<i>Arctostaphylos uva-ursi</i>		Perennial	LM	Plugs
Bentgrass	<i>Agrostis tenuis</i>	Colonial	Perennial	LM	Broadcast
Bugleweed	<i>Ajuga reptans</i>		Perennial	SW	Plugs
Chickweed	<i>Stellaria media</i>		Annual	SW	Plugs
	<i>Potentilla</i>				
Cinquefoil	<i>neumanniana</i>	Nana	Perennial	SW	Plugs
Five spot	<i>Nemophila maculata</i>		Annual	LM	Rows
Moss pink	<i>Phlox subulata</i>		Perennial	SW	Plugs
Mother of thyme	<i>Thymus serpyllum</i>		Perennial	SW	Plugs
Mother of thyme	<i>Thymus serpyllum</i>		Perennial	LM	Rows
Speedwell	<i>Veronica repens</i>		Perennial	SW	Plugs
Sweet alyssum	<i>Lobularia maritima</i>		Annual	LM	Rows
Sweet woodruff	<i>Galium odoratum</i>		Perennial	SW	Plugs
Clovers					
Kura clover	<i>Trifolium ambiguum</i>	Prairie	Perennial	LM	Rows
Subclover	<i>Trifolium subterraneum</i>	Antas	Annual	LM	Rows
Subclover	<i>Trifolium subterraneum</i>	Clare	Annual	LM	Rows
Subclover	<i>Trifolium subterraneum</i>	Dalkieth	Annual	LM	Rows
Subclover	<i>Trifolium subterraneum</i>	Denmark	Annual	LM	Rows
Subclover	<i>Trifolium subterraneum</i>	Mt Barker	Annual	LM	Rows
Subclover	<i>Trifolium subterraneum</i>	Nungarin	Annual	LM	Rows
White clover	<i>Trifolium repens</i>	Dutch	Annual	SW	Broadcast
Medics					
Barrel medic	<i>Medicago truncatula</i>	Caliph	Annual	LM	Rows
Barrel medic	<i>Medicago truncatula</i>	Parabinga	Annual	LM	Rows
Burr medic	<i>Medicago polymorpha</i>	Santiago	Annual	LM	Rows
Burr medic	<i>Medicago polymorpha</i>	Scimitar	Annual	LM	Rows
Black medic	<i>Medicago lupulina</i>	VNS, Montana	Biennial	LM	Rows
Black medic	<i>Medicago lupulina</i>	Afghanistan	Biennial	LM	Rows
Black medic	<i>Medicago lupulina</i>	VNS, Montana	Biennial	SW	Broadcast
		Clare, Mt.			
Subclover Mix	<i>Trifolium subterraneum</i>	Barker, Nungarin	Annual	SW	Broadcast
Trefoil					
Birdsfoot trefoil	<i>Lotus corniculatus</i>	Canada	Perennial	LM	Rows
Birdsfoot trefoil	<i>Lotus corniculatus</i>	Norcen	Perennial	LM	Rows
Birdsfoot trefoil	<i>Lotus corniculatus</i>	South America	Perennial	LM	Rows

Table 4. Growth of living mulches (LM) and weeds, 2005 planting.

Entry	Total Cover* (%)	Weed cover* (%)	LM peak stand biomass (g/m ²)	LM seedlings/ 100 cm ^{2**}	Canopy Height*** (cm)
Seeded LMs					
Scimitar burr medic	95	5	264	5	32
Santiago burr medic	93	7	192	2	33
Caliph barrel medic	87	13	256	4	31
Blk medic Broadcast, SW	87	8		2	
Dutch White Broadcast, SW	87	10	299	16	
Blk medic VNS	85	15	211	4	34
Denmark subclover	83	17	222	3	20
Parabinga barrel medic	82	18	182	2	32
Alyssum	81	19	236	8	28
Antas subclover	78	22	281	3	21
Dalkieth subclover	78	22	156	4	19
Clare subclover	77	23	184	3	28
Mt Barker subclover	73	27	265	4	24
BFT Norcen	73	27	294	7	39
Blk medic Afg	72	28	133	9	31
Sub Mix Broadcast, SW	72	27	226	9	
Nungarin subclover	68	32	120	3	15
BFT Can	67	33	215	6	34
BFT SA	63	37	222	6	34
Five Spot	55	45	104	2	22
Bentgrass	53	47			27
Prairie Kura Clover	25	75	62	7	15
Thyme	14	86	8	5	12
Perennial Transplants					
Thyme	93 a	7 d			
Phlox	67 b	23 c			
Woodruff	57 bc	na			
Ajuga	46 cd	33 bc			
Mint	38 de	na			
Veronica	30 ef	40 b			
Potentilla	18 fg	32 bc			
Kinnikinnick	10 g	90 a			
p=	0.000	0.000			

* 6 weeks post plant, **18 days post plant, ***2 months post plant

BFT= birdsfoot trefoil, SW=sandwich