The Second Annual

Compost and Farming

Viticultural Forum and Luncheon

Friday April 3, 1992 9 am - 1:30 pm.

1285 Whitehall Ln. St. Helena

(Part I. Composting Vineyards: Current Research)

9:00-9:40 a.m. **"Use of Compost in Vineyards of Trentino, Italy"**
Dr. Silvia Silvestri, *Instituto Agrario di S. Michele, Trento, Italia* 38010

9:40-10:10 **"An Experimental Model for Compost Research in the Napa Valley"**
Dr. Paul Skinner, *Vineyard Investigations, Winters, Ca.*

(Part II. Certified Organic Vineyards: Regulations and Practices)

10:10-10:20 1. **"Registration with The County"**
Joel King, *Agricultural biologist, office of the Napa County Agricultural Commissioner, Napa, Ca.*

10:20-10:40 2. **"Certification with C.C.O.F."**
David Letourneau, *certification committee chairman, North Coast Chapter C.C.O.F. Occidental, Ca.*

10:40-10:50 **Break**

10:50-11:20 3. **"Controlling Insect Pests in Certified Vineyards"**
Kate Burroughs, *Harmony Farms Supply, Sebastopol, Ca.*

11:20-11:50 4. **"Ecological Methods for Disease and Pest Control'**
Amigo Cantisano, *Organic Ag Advisor, Colfax Ca.*

(Part III. Equipment Demonstration)

11:50-12:15 1. **Tye Seeder,** a grain drill seeder. spader, an alternative to disking
John 0'Gorman, Lampson Tractor, Geyserville, Ca.

2. **Clemens Radius,** an all around weeder.
Mark Terrell, Lincoln Farm Equipment, St. Helena, Ca.

3. **New Leader Compost Spreader.**
Upper Valley Recycling, St. Helena, Ca.

12:15 Luncheon

1285 Whitehall Lane St. Helena, Ca. 94574

Supplemental Materials

(PART I)

Compost Research

"Use of Compost in Vineyards of Trentino, Italy"
Dr. Silva Silvestri

"An Experimental Model for Compost Research in the Napa Valley"
Paul Skinner, Ph. D.

EXPERIENCES OF COMPOST USE IN VINE-GROWING IN TRENTINO.

S. Silvestri, F. Pinamonti, G. Zorzi.
Istituto Agrario di S.Michele all'Adige (TN) - Italy

Since 1986 the Agrarian Institute of S.Michele a/A started an intensive experimental activity with the aim of verifying the compost suitability in fruit and vine-growing. Numerous agronomical experiences were set up using both MSW compost (obtained from not-separately collected organic fraction and coming from outside the province) and B+S compost produced at Trento. Both materials were compared in the field fertilizing, with cattle and poultry manure, in the planting hole with peat and vermicompost, in mulches with usual under-plant soil management techniques (such as weeding, surface cultivation and application of plastic films). The results obtained in the different agronomical compost uses are described below. All the data included in the tables refer to the third year after the compost application.

Field fertilizing

For this use that includes the ploughing in of the organic conditioner, it is possible to use coarse products with a relatively high content of inerts provided they have a good content of humified organic matter and fair nutritive properties (equal to those of manure). As for the distribution method the manure spreader is commonly used. In the vine-growing experiences in soil base fertilizing before establishing plants and for the levelling fertilization (n. 2) two compost types are tested: the first (B+S compost) was compared both with cattle and poultry manure on cv Marzemino; the second (MSW cmpost) only with cattle manure on cv Cabernet sauvignon at progressively higher doses (30 t/ha - 60 t/ha - 90 t/ha, each quantity for a three-year period). The data shown in the tables 2 and 4 refer to the vigour-yield results obtained at the end of three-year observations. In comparison to the first trial, the B+S compost fostered at the same extent as manure (control) and in a significatively higher way than poultry manure (table 1) the vine growth and production. In the second trial the grape production in compost fertilized plots was not different from the control, while there were significant differences in the plant nutritional state (N, Ca) - which seemed to be improved by high compost doses - as well as in the incidence of the stem necrosis, which was diminished as proved by BH/FA degree and K+/Ca + Mg ratio values (table 2) (the last not in a significant way). The quality characteristics of the musts deriving from compost fertilized treatments are positively modified as for sugars, total acidity and malic acid content. Besides, to the tasting the wine obtained from compost fertilized grapes was more full-bodied. The positive action of compost develops during the time and keeps after ploughing in of organic material; the final balance shows a more stable and persistent fertilizing action of the compost in comparison to manure. In some trials with MSW compost increasing contents of heavy metals in the soil are observed, but it never happens with the B+S product.

In hole planting fertilizing

This agronomical practice carried out during the phase of planting cuttings in the vineyard, with the aim of providing the best conditions for rooting and recovery of young plants, is generally done with peat or vermicompost. In this case, as a close contact

between organic conditioner and roots happens, the compost must be completely stabilized, with a low salinity, free of phytotoxic factors and with good physical properties.
Both the compost used during the realization of new vine-growing planting trials influenced (in the same extent as peat and vermicompost did) the growth of young cuttings and the yield precocity beginning in a positive way (table 3). In this connection, as shown in other use sectors and on the basis of the compost physical properties the B+S compost could be particularly suitable. The optimal amount seems to be 1-2 liters/vine cutting.

Compost mulch

Among the several cultural techniques aimed at reducing weed development undervine (mechanical tillage, weed control, mulching, grass covering), the compost-mulch - which is mainly aimed at limiting erosion, improving the soil water content and controlling weeds (Ballif and Herre, 1988; Artuso and Pinamonti, 1990) - is of particular interest also considering the diffused scarcity of organic matter in the soils of vineyards. On the other hand, the compost-mulch is not free from environmental implications, particularly because of the dynamics of the heavy metals present in the compost, particularly in the MSW-derived type (de Haan, 1989; Zorzi et al., 1991). From an agronomical point of view, the possibility of sowing selected dwarf grass species on the compost-mulch layer is being worked out. In this way it is possible to control the development of the weeds on the row without causing water and nutrients competition which is detrimental to the vines, and at the same time to reduce considerably the necessity of applying chemicals. On the basis of these assumptions, the Agrarian Institute designed and performed an experimental programme on 6 young vineyards on medium sandy and limy soils, typical of the hills around S.Michele a/A. The trials were carried out on 5 cultivars altogether (Meunier, Pinot grigio, Merlot, Schiava and Chardonnay) in non-irrigated plots and with gradients varying between 10% and 35%. In every case a randomized complete block experiment design with 5 replicates was adopted, in which the treatments were represented by 4 different management systems on the row:

- MSW compost;
- B+S compost;
- PE film: black polythene plastic film (0.2 mm thick).
- surfacing cultivations at the 1st year and local chemical weed control in the following years (control).

The two compost types were distributed on the row in order to obtain a layer of mulch 50 cm wide with a depth of 5 cm. On some of the compost mulched plots finally, the following grass species were sown: Festuca rubra Var. Kos, Poa pratensis var. Baron, Trifolium repens var. Huia, Trifolium subterraneum var. Woogenellop, Lotus cornicolatus, Brassica rapa var. Perko, Medicago lupolina var. Virgo and Phacelia tanacetifolia var Balo. In all the plots the following parameters were observed:

- weed growth on the row;
- variations of moisture status and temperature of the soil under the mulch;
- vine vigour and size (shoot radius, pruning weight, nutritional leaf blade constituents);
- berry composition;
- covering rate of the grass species sown on the row and the respective rate of weed control;

- heavy metals content in the soil and vegetation.

All the surveys on the soil were performed to a depth of 20 cm: the measurements of temperature and moisture were taken during the first year of mulching; the observation of chemical variables and heavy metals was done at the end of the third year. Leaf analysis was conducted on samples taken at veraison from the third year. The covering rates of weeds and the grass species were recorded in May and September of each year.

RESULTS

Overall the data obtained from the trials prepared by using the two composts (MSW and S+B) indicated a general improvement in the development of the young vine plants in the early growth phase and showed a positive effect inducing an earlier start of production. The compost-mulch proved particularly effective in the first two growing seasons and for the soil less well endowed with organic matter. In every case the positive effect of the compost can been attributed to the improvement in moisture and fertility of the soil. The following effects can be considered to have caused the observation described above:

- From the chemical point of view, the compost-mulch, in particular the B+S one, caused slight increases in organic matter and nitrogen content; while the amount of absorbable phosphorous and exchangeable potassium increased significantly with both types (table 4);
- The water consumption under the compost mulched plots was constantly and significantly lower in comparison with both control and plastic mulched treatments (fig. 1).
- The compost treatment also prevented the excessive increases of temperature in the soil, which occured in treatments with black polythene (fig. 2).

The leaf analysis (table 5) revealed that the compost increases the content of potassium in vine leaf blades, while the concentration of Mg and B tends to slight decreases. An increase in the potassium content was registered also in the musts (table 6), while the other analysed parameters were shown to be unaffected by compost treatment.
With respect to weed control it was shown that compost treatments restrict the growth to the same extent as the treatments of the control (mechanical tillage and herbicides). This positive effect, more marked for the MSW compost than the S+B type, diminished during the first growth season, while the positive effect of the plastic film continued to the fourth year. Therefore it has been noted the necessity to determine new solutions, that, combined with mulching, will allow for a more prolonged weed control. For this reason following grass species were sown on layers subsequently to the application of compost: Festuca rubra, Poa pratensis, Trifolium repens, Lotus cornicolatus, Brassica rapa, Medicago lupolina and Phacelia tanacetifolia gave good results, establishing themselves rapidly and avoiding in the row the infestation of weeds and thus the requirement of chemicals. Contrary to this poor results were obtained for Trifolium subterraneum, because of its poor resistance to unfavourable climatic conditions (winter). In parallel with the positive effects found in the restriction of weed growth, it was recorded the marked resistance by gramineae to mowing, and the necessity to reseed the species Phacelia and Brassica annually, and for the legumineae after the third year. Referring to the MSW compost it was recorded that the heavy metals have a tendency to accumulate in the soil under the mulch layer, as well as in the vine leaves (table 5) and

in the musts. With thw B+S compost-mulch the heavy metals increases were more limited and present only for Zn in the soils and Ni in leaves and musts (tables 10, 12, 13). On the other hand a significant decrease of the absorbable form of heavy metals was found in the soils with intrinsically higher quantity of these elements (lead and copper in Meunier and Schiava, respectively). This is due to the compost organic matter capability of fixing part of the contaminants in the colloidal matrices, thus rendering the contaminants less absorbal with respect to the culture.

CONCLUSIONS

The experiences of compost use in vine-growing show that:

- in the field fertilizing the compost application affected the yield quality and quantity at the same extent as manure;
- in hole planting fertilizing fostered the growth and the early start of production of vine cuttings at the same extent as peat and vermicompost;
- the compost-mulch gave positive agronomical results, both for the soil and the vine vigour and yield; its capacity to control the weeds is maintained for only one vegetative season but the possibility to cover the row with selected grass species is in course of verification. For the MSW compost the possibility of heavy metals accumulation in the soil and in vegetation emerged, while the B+S compost seems to have a lower influence on the concentration of these substances in the vegetative parts of the plant and in the yield.

REFERENCES

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TABLE 1 : GROWTH AND YIELD OF cv MARZEMINO IN A FERTILIZED VINEYARD

MATERIALS	Shoot radius (cm)	Pruning weight/vine (g)	Yield/vine (Kg)
MANURE (60 t/ha)	0.99a	237ab	0.90
POULTRY M. (30 t/ha)	0.93b	194b	0.79
B+S COMPOST (50 t/ha)	0.98a	309a	0.97
	*	*	

(*) P = 0.05 ; (* *) P = 0.01

TABLE 2 : LEAVES ANALYSIS AND STALK NECROSIS INCIDENCE OF cv CABERNET SAUVIGNON

MATERIALS	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	K/Ca+Mg	BH/TA
MANURE (TEST) 30 t/ha	2.78ab	0.20	1.64a	2.67ab	0.36	3.54a	3.3[illegible]a
MSW COMPOST 30 t/ha	2.73b	0.18	1.42b	2.61b	0.37	3.48ab	2.65a
" " 60 t/ha	2.78ab	0.18	1.39b	2.75a	0.38	3.44b	1.80ab
" " 90 t/ha	2.84a	0.19	1.30b	2.77a	0.38	3.41b	0.90b
	*		*	*		* *	*

TABLE 3 : GROWTH AND YIELD OF cv SCHIAVA IN HOLE PLANTING FERTILIZED

MATERIALS	Shoot radius (cm)	Pruning weight/vine (g)	Yield/vine (Kg)
PEAT	2.16	450a	6.2[illegible]a
VERMICOMPOST	2.11	373b	5.96b
MSW COMPOST	2.11	407ab	6.3[illegible]a
		*	*

TABLE 4 : ANALYTICAL CHARACTERISTICS UNDER THE LAYERS OF MULCH

MATERIALS	pH	E.C. mS/cm	C.T. (%)	C.A. (%)	O.M. (%)	C/N	N (%)	P ass. mg/Kg d.m.	K sc. mg/Kg d.m.	Mg sc. mg/Kg d.m.
TEST	7.73a	8.30b	32.6	1.15	2.68b	7.8	0.20b	80b	114	358
B+S COMPOST	7.68b	9.10a	30.9	1.06	4.20a	7.9	0.31a	115a	152	403
MSW COMPOST	7.74a	8.95ab	29.5	1.09	3.01b	7.6	0.23b	98b	173	374
	*	*			* *		*	*	* *	

TABLE 5 : MACRO AND MICROELEMENTS CONTAINED IN THE LAMINA OF LEAVES

	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	Fe (mg/Kg d.m.)	Mn (mg/Kg d.m.)	B (mg/Kg d.m.)	Zn (mg/Kg d.m.)	Cu (mg/Kg d.m.)	Ni (mg/Kg d.m.)	Pb (mg/Kg d.m.)	Cd (mg/Kg d.m.)	Cr (mg/Kg d.m.)
TEST	2.51	0.18	1.03c	2.28	0.35a	92	173	31a	40	323	6.0b	4.7ab	0.56b	3.0b
B+S C.	2.49	0.17	1.11b	2.22	0.31b	99	166	28ab	46	345	6.8a	4.0b	0.34b	3.3ab
MSW C.	2.52	0.18	1.22a	2.25	0.30b	96	173	26b	44	291	6.6a	5.1a	0.75a	3.4a
			* *		*			*			*	*	* *	*

TABLE 6 : QUALITATIVE CHARACTERISTICS OF MUSTS

	BABO (g/l)	SSC (g/l)	pH	tot. Ac. (g/l)	K tot. (%)	Tart. Ac. (g/l)	Malic Ac. (g/l)
TEST	17.0	179	3.16	9.51	1.30b	6.38	3.99ab
B+S COMPOST	17.3	184	3.22	9.80	1.37ab	6.34	3.85b
MSW COMPOST	17.1	179	3.16	9.86	1.41a	6.47	4.22a
					* *		*

Fig.1 – SOIL MOISTURE UNDER LAYERS OF MULCH (depth of 20 cm)

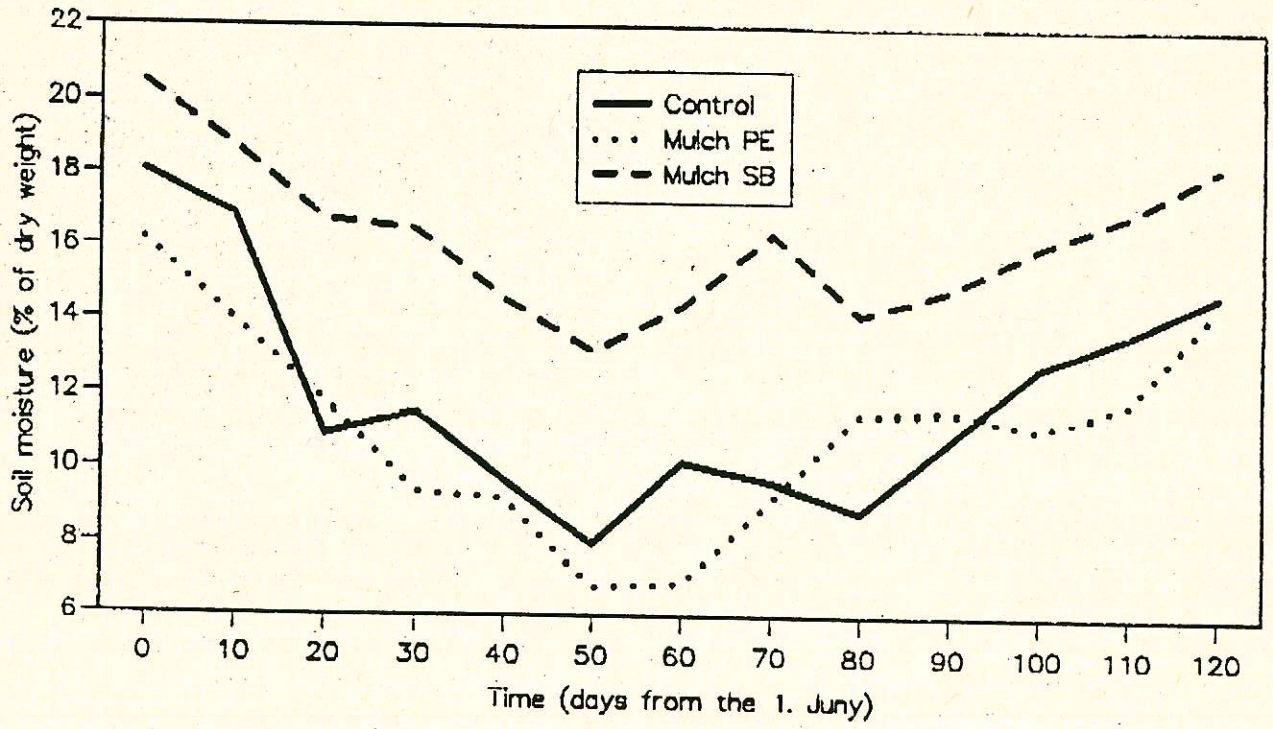
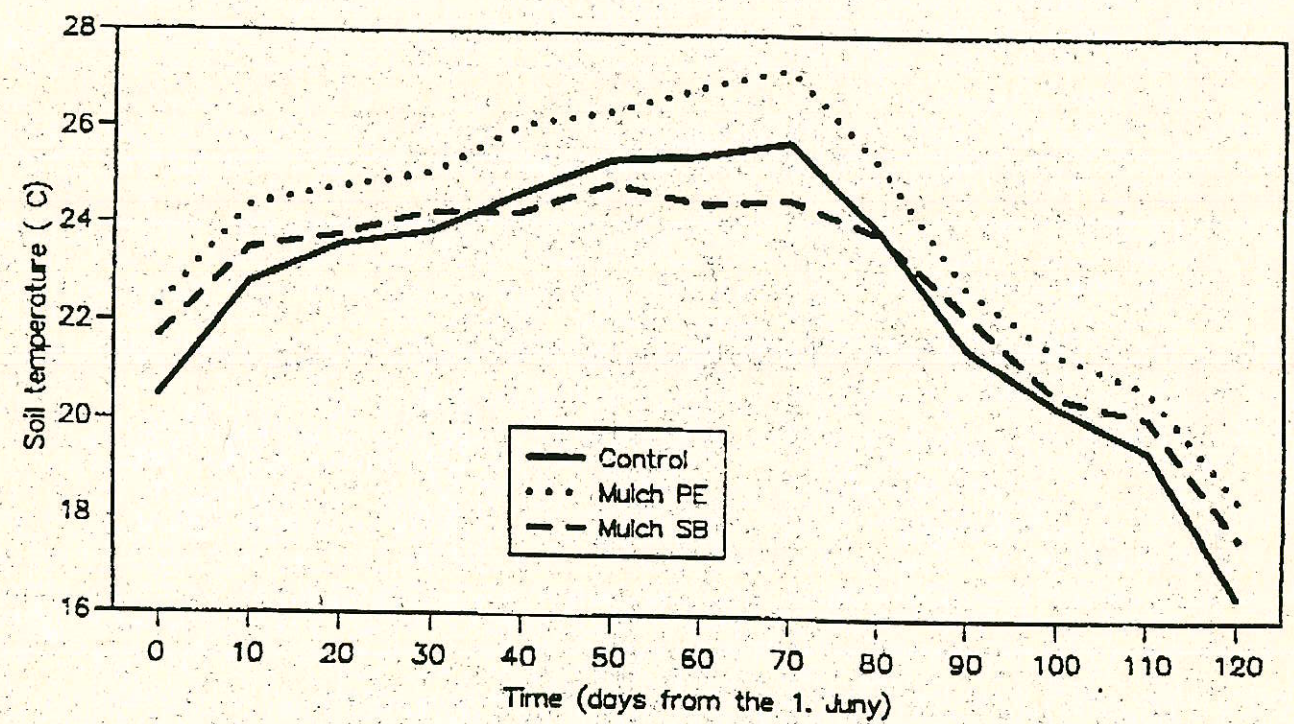


Fig.2 – SOIL TEMPERATURE UNDER LAYERS OF MULCH (depth of 20 cm)



Vineyard Investigations

Experimental Model

for

THE USE OF COMPOST IN VINEYARDS

August 1991