Santé de l'environnement
Environmental Health

Use of industrial by-products in the production of wild blueberries

Many industrial by-products with interesting characteristics for agriculture are available. Scientists from Agriculture and Agri-Food Canada (AAC) have completed a study on the use of some of these by-products to increase the productivity of blueberries on degraded and low-fertility soils.

The objectives of this project were: to determine the ideal combination of bio-solids, wood ash and ground bark to be applied to blueberry soils to increase blueberry yields, and to assess the impact of these materials on the mineral composition of leaf tissue.

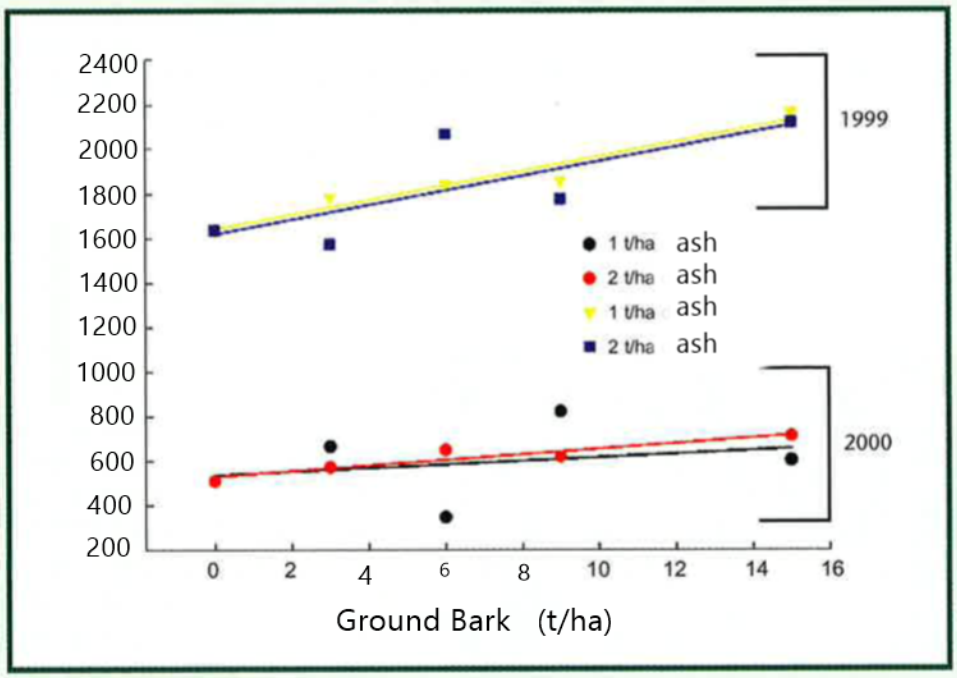
Treatments consisted of a combination of biosolids (a mixture of primary and secondary sludge from paper mills) (15 tons per hectare wet weight), wood ash (1 and 2 t/ha dry weight) and ground bark (0,3,6,9 and 15 t/ha). The residue applications were carried out during the blueberry's vegetative year (1998). The leaf tissue samples were taken at the end of July the same year. Yields of fresh fruit were determined for 1999 and 2000.

Amendment Properties

Biosolids are an interesting source of nitrogen (2.29%) phosphorus (0.50%). The carbon/nitrogen ratio (C/N) is 23, indicating that this amendment is easily decomposable by soil microorganisms. Ash is a good source of calcium (15%), potassium (3%), magnesium and phosphorus (0.4%). Biosolids and ash meet the agricultural valuation standards of the Quebec Ministry of the Environment (2004). Ground bark is a source of carbon but is difficult to break down (C/N ratio of 247).

Effect on yields

In 2000, a severe frost occurred in early June, destroying nearly 70% of the blossom. As a result, fruit yields were a third of those in 1999 (Figure 1). Ground bark increased yields by 31-29% compared to the control. Wood ash had no impact on yields.



Composition minérale des feuilles
(Mineral composition of leaves)

The results of leaf analyses indicated an increase in phosphorus and potassium with the application of 2t/ha of ash (Table 1). Calcium and magnesium concentrations were not influenced even by applications of 2t/ha of ash. Nitrogen levels in the leaves were not affected by the amendments. The concentrations of heavy metals in the leaves were not affected by the applications of bio-solids, ash or bark. Only the nickel concentration of the leaves decreased with the application of 2t/ha of ash.

Nutrient levels of leaf tissue were within the standards proposed by Trevett (1962), and Lockhart and Langille (1962), with the exception of manganese levels, which were half the proposed lower limit.

Table 1. Effect of bio-solids, wood ash and ground bark on the mineral composition of leaves during the vegetative year (1998)

Cendres de bois [Ash]			1 t/ha				2 t/ha			
Écorces broyées (t/ha) [Ground Bark]		0	3	6	9	15	3	6	9	15
N	%	1,98	2,07	2,02	2,12	2,20	2,14	2,00	2,04	2,05
P	%	0,17	0,18	0,18	0,19	0,20	0,18	0,18	0,18	0,19
K	%	0,69	0,75	0,73	0,73	0,74	0,72	0,77	0,71	0,76
Ca	%	0,34	0,34	0,34	0,34	0,34	0,34	0,35	0,36	0,32
Mg	%	0,16	0,14	0,15	0,15	0,16	0,15	0,16	0,16	0,14
Fe	mg/kg	32,6	30,0	32,3	27,6	32,1	31,4	33,5	34,1	34,3
Mn	mg/kg	253	244	245	247	242	256	253	253	247
Cd	mg/kg	0,16	0,12	0,12	0,12	0,09	0,09	0,13	0,04	0,16
Co	mg/kg	0,23	0,42	0,47	0,50	0,53	0,42	0,36	0,48	0,51
Cr	mg/kg	0,65	0,67	0,52	0,40	0,57	0,60	0,55	0,70	0,77
Cu	mg/kg	6,26	5,83	5,74	6,52	5,59	5,18	5,40	5,63	5,59
Ni	mg/kg	1,23	0,97	1,14	1,10	1,27	1,19	1,04	1,26	1,06
Pb	mg/kg	0,36	0,61	0,32	0,51	0,37	0,46	0,59	0,29	0,32
Zn	mg/kg	13,9	14,2	14,0	15,0	14,9	14,1	13,4	14,2	14,0

Conclusions

The use of organic solids (15 tons/hectare wet weight) mixed with wood ash and ground bark as a source of nutrients has helped to maintain the productivity of the blueberry fields. However, wood ash has had no impact on fruit yield. A maximum rate of 1ton/hectare should be respected so as not to raise the pH of the soil.

The results of the foliar analyses indicated that nutrient concentrations were within the standards. This suggests that the massive application of ground bark (15 tons per hectare) has not resulted in an imbalance in the nutritional status of the plant, particularly with regard to nitrogen.

This research was made possible thanks to the financial support of the Cost Sharing Program for Research and Development of AAC, and the Syndicat des Producteurs de Bleuets du Québec.

Photos and text: Jean Lafond, Ferme de recherches, Normandin

Email : lafondj@agr.gc.ca

Reference

Environnement Québec. 2004. Guide sur la valorisation des matières résiduelles fertilisantes. Critères de référence et normes réglémentaires. Gouvernement du Québec. 127 pages.

Lafont, J. 2004. Application of paper mill biosolids, wood ash and ground bark on wild lowbush blueberry production. Small Fruit review Vol 3 No. 1/2:3-10

Lafont, J. and R.R. Simard. 2001. Valorisation d'amendements organiques et minéraux dans la production de bleuets nains sauvages. Rapport final. 54 pages.

Lockhart, C.L. and W. M. Langille. 1962. The mineral content of lowbush blueberry. Can. Plant Dis. Survey 42: 124-128.

Trevett, M.F. 1962. Nutrition and growth of the lowbush blueberry. Maine Agr. Expt. Stat Bull. 605. 151 pages.

For extra copies, please contact the author at the following address:

Ferme de Recherches

Agriculture et Agroalimentaire Canada

1468, rue St-Cyrille

Normandin (Québec) G8M 4K3

Telephone: 418 274-3378

Agriculture et Agroalimentaire Canada

Agriculture and Agri-Food Canada

Canada