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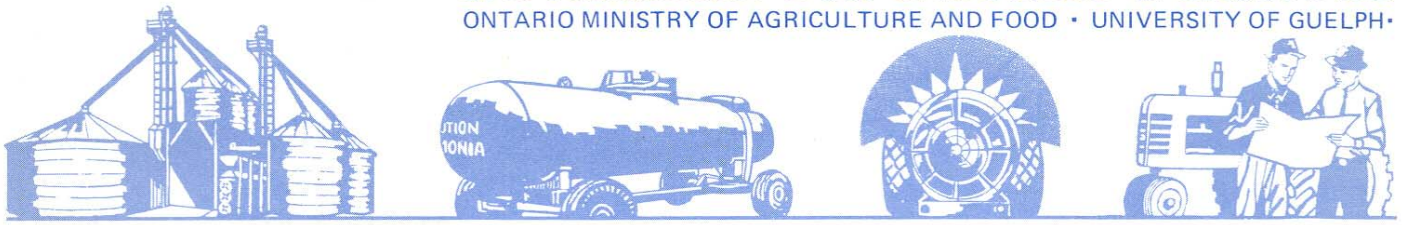

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Alfalfa Rhizobia in Southern Ontario Soils

Soils from 37 farm sites across Southern Ontario were tested for the presence of Rhizobium meliloti, the alfalfa rhizobia. These rhizobia were absent in soil samples from only one of 37 farms. Populations of rhizobia were low in soils which were both acidic and had a high sand content. In all other soils tested, the rhizobia were present. Most of the soils causing poor modulation came from the four counties in extreme Eastern Ontario.

Nodules on alfalfa are caused by Rhizobium meliloti. These rhizobia are able to fix up to 300 kg/ha of atmospheric nitrogen (N2) and supply all the N required by the crop. Commercial inoculant is sold for this crop, but the need for it has been questioned because most farms may have high enough populations of rhizobia to give good modulation of alfalfa.

More recently, there has been concern on the part of regulatory agencies regarding survival of rhizobia in the coatings of pelleted alfalfa seed.

Possible future requirements to treat alfalfa seed with fungicides against Verticillium wilt also has raised concern about the effect of seed dressing fungicides on survival of seed-applied inoculants for alfalfa. These concerns about alfalfa rhizobia lead to questions on where inoculation is necessary.

To get a preliminary answer, we tested soil samples from 37 farms across Ontario for their ability to nodulate alfalfa. The soil samples had been collected by OMAF Soils and Crops Specialists from farm sites which were used in 1978 to grow soybean variety demonstration strips. A one gram subsample out of each soil sample was applied to sterilized Apollo alfalfa seed growing in diSpo ® plastic growth pouches in a growth room at Guelph. Pouches contained ten seeds and at least two pouches were grown for each soil sample. There was one soil sample from each location shown in Fig. 1, except that we had five soil samples from location 1, 4 from location 2, and 2 from location 35. These locations are shown on Fig. 1.

Soils from all of the locations caused modulation, except for the soil from location 34, near Moose Creek, in Stormont County. At this site, the soil is a low-lying, poorly drained sand which has not grown alfalfa before, as far as is known.

In most cases, nodulation in the pouches was abundant. If modulation was abundant after adding 1 g of soil to ten seeds, then alfalfa grown directly in these soils should be adequately modulated.

Soils from three locations, 22, 35 and 36 failed to nodulate alfalfa in at least 50% of the pouches. The soil samples were run through standard soil analysis in the Department of Land Resource Science and we ran particle size analysis on the soil samples to determine soil texture. The pH and soil texture of the soils causing poor modulation are shown in Table 1.

Soils from location 34, which did not cause modulation, had the highest sand content of all the locations tested. The pH was 6.6, which was not particularly low. The lack of modulation from soils at this site may indicate that alfalfa has not

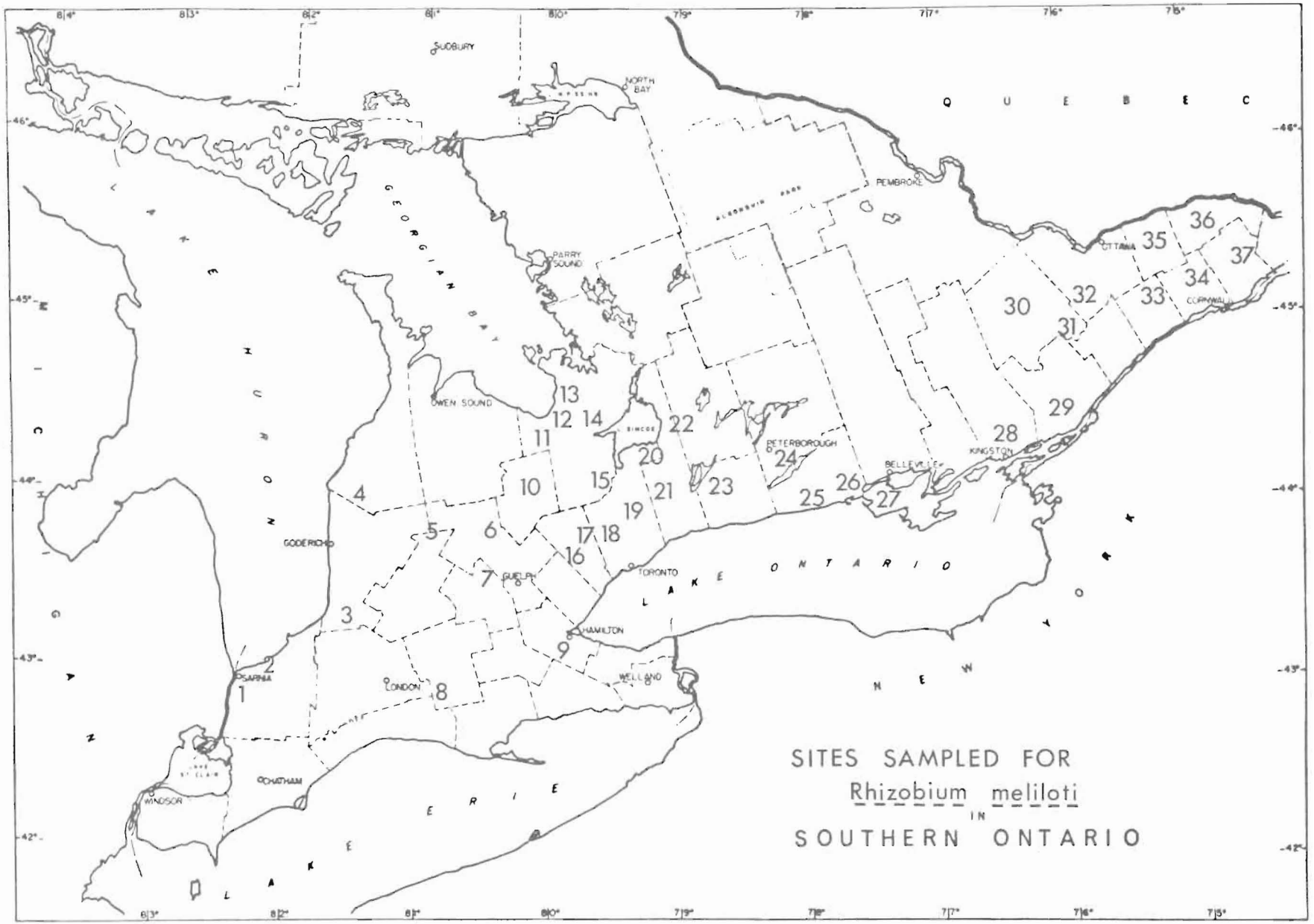
been grown on this sandy soil.

Soils from the three locations which failed to nodulate alfalfa in 50% or more of the pouches also had low pH values and locations 22, near Woodville in Victoria County, and 36, near Fournier, in Prescott County, had high sand contents. Locations 35a and 35b represent two soil samples from the same farm near Bourget in Russell County. The soil sample with a pH of 6.0 which was a clay loam, did not cause modulation in either pouch, but the soil sample with a pH of 6.6, a sandy loam, caused modulation in one of the two pouches. The results in Table 1 suggest that alfalfa rhizobia are present in only limited numbers in low pH soils, particularly in Eastern Ontario. Soil pH values between 6.0 and 6.2 were found for locations 16, 29 and 37. Soils from these sites caused modulation, although only two nodules per pouch formed with soils from location 29 (Lyndhurst) and there were only a few nodules formed with soils from location 37 (North Lancaster). These were loam and silty clay loams, respectively. Location 16, near Victoria in Peel County, had a pH of 6.0, but nodulation appeared adequate, although not abundant. Location 10, near Shelburne in Dufferin County, had a pH of 6.5 and a sandy loam. Soils from this location caused few nodules in the pouches. All other locations gave good modulation.

Two things are apparent from these results. In most of Ontario, alfalfa rhizobia appear to be present in numbers large enough to give good modulation. Results for several of the sites in Eastern Ontario suggested that alfalfa should be inoculated there. This was particularly true in Prescott, Russell, Stormont and Glengarry Counties. Acidic, sandy soils in other areas may have low populations of alfalfa rhizobia. Sandy soils with neutral pH values and heavier soils in Central Ontario appeared to contain populations of rhizobia high enough that responses to inoculating alfalfa would be unlikely.

Table 1. Conditions where soil samples caused poor nodulation or very few nodules.

	Locations	pH	% Clay	% Silt	% Sand
Location from which soils failed to nodulate alfalfa in both pouches	34	6.6	6.2	7.0	86.8
Locations from which soils failed to nodulate alfalfa in at least 50% of the pouches.	22	5.9	4.8	19.8	75.4
	35a	6.0	34.5	29.8	35.7
	35b	6.6	17.4	21.3	61.4
	36	5.4	7.0	11.4	81.5


SUDBURY
NORTH BAY
PEMBROKE
OTTAWA
PARRY SOUND
OWEN SOUND
GODERICH
SARNIA
LONDON
GUELPH
TORONTO
HAMILTON
WELLAND
KINGSTON
PETERBOROUGH
BELLEVILLE
CORNWALL
CHATHAM
WINDSOR
QUEBEC
LAKE ONTARIO
LAKE ERIE
GEORGIAN BAY
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37
SITES SAMPLED FOR
Rhizobium meliloti
IN
SOUTHERN ONTARIO