PETUN TOBACCO EXPERIMENTS

Abstract

Experiments are reported concerning the possession and cultivation of tobacco by the Petun-Wyandot Indians in seventeenth century Ontario.

On a fait un compte-rendu sur les expériences au sujet de la possession et de la cultivation di tabac par les Indiens Petun-Wyandot en Ontario au dix-septieme siècle.

Introduction

Although there is not even one unchallengeable, reliable, contemporary, eye-witness account specifically of the "Nation du Petun" (Tobacco Nation) having, growing, trading and/or smoking tobacco, the belief that they did all these things, and were consequently named for their association with the tobacco plant, is widespread.

That they were named for some association with the tobacco plant is accepted, and it can be reasonably assumed that the Petun people, in common with other similar Iroquoian agricultural peoples, such as the Huron (Jesuit Relations & Allied Documents, 1989 11:7), grew, possessed and smoked tobacco. The frequent finding of remnants of clay and stone smoking pipes on Petun archaeological sites has been accepted as evidence confirming this assumption, although many fragments show no sign of having been used. It is noted that the stone (usually limestone) pipe bowls found on Petun archaeological sites to date are always clean, and show no evidence of having been used for smoking. Several clay pipe bowls, by contrast, do show evidence of having been used for smoking, as they contain compacted material which seems to be residues from use, mixed with other matter presumably acquired during the three and more centuries the artifact was buried in the ground. We could not ourselves determine conclusively that the residues were, or contained, tobacco.

In 1971, Lyal Tait, a retired tobacco farmer and author of the books "Tobacco in Canada" (1968), and "The Petuns - Tobacco Indians of Canada" (1971), donated some commercial tobacco seeds to J. "Jay" Allan Blair of Collingwood with the suggestion that we experiment with growing tobacco in the Petun area.

The seeds provided were *Nicotiana Tabacum*. We were concerned that experimentation with this variety of *genus Nicotiana* would not much reflect the experience of the Petun, who, we were confident, would have used *Nicotiana Rustica*, the North American native tobacco (Garner, Wightman W. "The Production of Tobacco" 1946:12, 47), or a related quick-growing variety. *Tabacum* requires a longer frost-fee season than is available at Ontario latitudes, and in commercial production is started early in climate-protected green-house seed-beds, followed by transplantation into the ground after the last frost. *Rustica*, in contrast, requiring a much shorter growing season, can be sown as seed directly into the ground after the last frost. Lyle Tait argued that the Petun could have cultivated *Tabacum* by starting the seeds early indoors in bark troughs of swamp muck. As the Hurons practised prior-germination of corn kernels, (Sagard, G. "The Long Journey to the Country of the Hurons" 1939:103) this suggestion was deemed not unreasonable merely because there was no known record of it. Lyle Tait further speculated that as the absence of light was not a factor, tobacco seeds could be germinated in long-houses as easily as greenhouses, and the growth of the resulting seedlings accelerated

for consideration during the experiment, and, in return, Lyle Tait agreed to contact the Canada Department of Agriculture's Tobacco Research Station at Delhi, on our behalf, to see if *Rustica* seeds could be obtained.

Enquiring about germination bed material, we learned that swamp muck is the preferred commercial bed, but requires boilers, steam piping, steam treatment and chemical sprays to control unwanted seeds and insects in the muck. We considered that because this technology was not available to the people whose tobacco cultivation practices we were trying to follow, they probably did not use swamp muck. Dr. Conrad E. Heidenreich suggested that the Petuns might have used wood punk, as it was readily available from their forest environment. As it was not so readily available to us, Mr. Frank Kingdon suggested we could substitute any of the vermiculite products sold for the purpose at any commercial nursery or garden supply outlet.

The first experiment indoor germination of *Nicotiana Tabacum*.

Jay Blair, Jim Shropshire and Charles Garrad took seeds and, following Lyle Tait's instructions, planted them indoors near the end of March 1972 (Garrad on March 29). Jay used sand as a bed, Jim used potting soil, and the writer used nursery vermiculite. An unexpected difficulty was using a small enough sample of seed. Bearing in mind that only two ounces of the tiny seed, about four tea-spoonsful, requires a 30'x80' greenhouse for germination, and plants 20 to 30 acres of land at commercial spacing, it was difficult to estimate how few seeds were appropriate for a small planting dish.

This first experiment ended unsatisfactorily when none of the seeds germinated. It was concluded initially that the seed was at fault, but the later second experiment suggested several other factors which may have contributed to the failure.

The second experiment - indoor germination of Petit Havana

In March 1972 Lyle Tait reported he had contacted the Tobacco Experimental Station at Delhi to enquire about the availability of *Nicotiana Rustica*, and had learned that it was not available, but a very close substitute was, and "probably is the closest thing to Rustica that we can get". This was described to us as "an early-maturing type of burley called "small pipe" or "Petit Havana" ... It grows two feet high and has the same small leaf as Rustica. The earliest Quebec Habitants grew it, so it may have been developed from an Indian variety. As it requires only 80 days from seed planting to flower, and another two weeks after the flower is "topped", it may be planted directly into the ground rather than pre-germinated".

It was decided to try both indoor seeding, as we had the equipment set up and the time of year was appropriate, and direct in-ground seeding after the presumed last frost.

Enquiry to the Atmospheric Environment Service of Environment Canada as to when the last frost might occur, produced the opinion that the average frost-free season for Nottawasaga Township is May 12 to October 12 (letter, G. L. Pincock to Garrad, January 5, 1972). We agreed that June 1 should be a safe transplanting date.

Jay Blair, Helen Hargrave and Charles Garrad planted seeds indoors in a variety of bed material. Jay Blair used sand, Helen Hargrave used soil, and Charles Garrad used nursery vermiculite. Garrad's were planted March 29 in covered and open dishes and pots. By April 8, seedlings were showing in all the containers, but by April 26 the plants, now about ½" high, were wilting. The possible causes may have included too little or too much water, draught, temperature change, overcrowding, and, in the case of sand and vermiculite, the lack of nutrients in the beds at a time when the seedling growth should become rapid. The few

transplantable seedlings grown by Garrad in Toronto did not survive the trip to Collingwood. Jay Blair in Stayner was more successful and we planted seedlings at seven locations on May 20, 1972, with the expectancy that these would be lost by frost. The expected last spring frost occurred during the night of June 10. All tobacco, corn and potatoes were killed in Sunnidale, Midhurst, Minesing and Barrie. Some damage was observed in Creemore-Websterville by Helen Hargrave, and in Stayner by Jay Blair. Jay studied the frost patterns, and reported that in very calm air, the frost "puddled" into the lowest areas, and that sometimes a few inches elevation, such as the camber of a road, often separated frosted and frost-free areas. From this observation, Dr. Heidenreich suggested (personal communication) that the native practice of planting in small circular "corn hills" surrounded by interstice gullies served to effectively drain frost away from the plants. Many such "corn hills" were found in the former Petun homeland during settlement, raising the possibility that some may have served for tobacco cultivation.

All the outdoor transplanted seedlings were destroyed by the frost of June 10, but one cultivated by Helen Hargrave, which had remained indoors, survived, and was transplanted into her garden on June 19. This was the sole survivor of the second experiment, but it soon disappeared, presumably to a vegetarian predator.

The third experiment further indoor germination of Petit Havana.

This experiment was undertaken by Jay Blair and Helen Hargrave to test the hypothesis that the lack of nutrients in the seed bed material was the cause of the seedlings wilting. More seeds were planted. Jay used organically rich muck from a woodlot, and Helen planted seeds into sterilized soil May 24. Both experiments produced rapidly growing healthy plants, almost spectacular in comparison to the previous crop. Most of these were transplanted into selected and monitored locations, but all quickly disappeared by being eaten, crowded out by faster-growing species (including grass), or other causes, including being pulled by mistake as a suspected weed. In September we observed that, to date, none of the plants germinated indoors from seed, and then transplanted outdoors as seedlings, had survived.

The fourth experiment - late transplantation of Petit Havana

Some of the plants germinated indoors by Jay Blair using the rich soils were kept indoors until the leaves were a full inch across. These were transplanted to selected locations in September to await destruction by frost, and most survived other hazards until claimed by frost. Jim Shropshire reported the first frost in Creemore on Saturday September 23. This was slight, enough to whiten the grass but not to damage plants. Frost was forecast for September 28, but did not occur. Helen Hargrave reported that all her outdoor squash, pumpkins and annual flowers at Websterville, west of Creemore, were killed by severe frost October 9. At the north end of the Petun territory (Donald E. Plater farm at Craigleith), a September light frost killed weeds but not the tobacco, which survived until the first killer frost on October 28. Inland sites at higher elevations had several light frosts, some damage October 17 & 18, and major damage November 17 & 18. Even later, sheltered plants on the Melville and Smith farms were found partly alive.

The fifth experiment - direct seeding of the ground.

Seeding directly into the ground experiment by Jay Blair and Helen Hargrave was a success. Helen planted seeds in her clay-gravel vegetable garden soil in mid-June. The resulting seedings reportedly grew slowly in the summer, more rapidly by the end of August, and a mature plant was pulled up at the end of September, having reached the point where it would

otherwise require "topping", or allowed to go to seed. This experience demonstrated that prior indoor-germination was not necessary to produce a mature smokable plant, but not, on this occasion, that the complete seed-to-seed propagation cycle could occur within the frost-free season. This plant was placed between the ceiling joists in Helen's furnace room to simulate long-house rafter air drying. By the end of October the leaves were noted as "brown, dry, brittle".

Jay Blair successfully raised a single plant from seed planted in a mound hoed to the height of several inches, in the shelter and protection of a fenced garden in Stayner, fairly close to the house in which he was then residing. The garden was protected from animal vegetarian predation and kept clear of competing weeds. On September 30, 1972, Jay moved to Collingwood, and abandoned the plant to go to seed. This it reportedly did before frost, demonstrating that the propagation cycle could occur within the available frost-free season.

In view of the total failure of all unprotected plantings, the successful raising of plants from seed by Jay Allan Blair and Helen Hargrave in their respective vegetable gardens was hailed as a spectacular success, and, in addition, demonstrated that weeding and physical protection were essential to successful small-scale tobacco horticulture.

The sixth experiment curing and smoking the tobacco.

Over the winter 1972-1973 leaves from the plant grown by Helen Hargrave were suspended above her hot-air furnace in simulation of a possible long-house drying procedure. With the spring of 1973 came the challenge of finding and convincing an innocent pipe smoker to try the product. The problem was overcome when William "Bill" Ross, then a student interested in Petun research for his M.A. thesis, appeared, complete with pipe, and an innocent willingness to experiment.

The tobacco leaf to be tested was crumbled into small fragments by fingers. Unfortunately, lacking appropriate measuring devices, no precise records were kept at the time of this and subsequent events. In the writer's recollection, the ease with which the leaf crumbled, and the considerable speed with which it burned in Bill Ross' pipe bowl, indicated we had over dried it. We wondered if this part of the Petun tobacco curing process was controlled by adding slower burning non-tobacco organic plant material. Marius Barbeau ("Tobacco a peace-maker", 1953:106) suggested that additives such as sumac leaves, and inner bark of dogwood, were added to *Rustica*, but this was to lessen its strength. Having no additives selected and prepared to add to our experimentally produced Petit Havana, Bill smoked it as it was. In a letter to the writer dated October 22, 1996, Bill offered the counter-proposal that the tobacco was under-cured rather than over-cured. He recalled:

"... the tobacco was quite harsh and burned quite hot. It was not the most pleasant to smoke, but was quite strong. I always felt that part of the problem was in the curing of the tobacco. Perhaps time might have made a difference, i.e. if it had been cured for a longer period of time. My other recollection was that it was quite green and did not crumple well. This too, I think, was caused by the length of time of curation. Certainly it was smokable, although harsh to one used to modern cured tobaccos."

We took satisfaction both in having produced a smokable tobacco product, and that the smoker survived to go on to greater things.

The seventh experiment analysis of tobacco bowl residues.

During his contact with the Tobacco Research Station at Delhi on our behalf, Lyle Tait asked if the residues found in several Petun pipe bowls could be analyzed to demonstrate the presence of tobacco. This resulted in a letter from L. S. Vickery, Director (December 6, 1972), to Charles Garrad. stating:

"We shall be glad to analyze this tobacco for alkaloid content .. one of which would be nicotine. There is probably one main factor that may enter into the analysis and that is whether considerable moisture over the long period of time has leached out the alkaloids. In the meantime I shall look into this more thoroughly".

Both the potential analysis and the "looking into" were assigned to Dr. Nestor Rosa, a Research Scientist at the Station, who contacted Professor J. A. Weybrew of the School of Agriculture and Life Sciences at North Carolina State University at Raleigh for consultative advice. Four pipe bowls with intact residues were delivered to Dr. Rosa, being one each from four Petun archaeological sites, Hamilton-Lougheed BbHa-10, Graham-Ferguson BcHb-7, Plater-Martin BdHb-1, and Plater-Fleming BdHb-2. The four sites are the remains of Petun villages occupied during the period of Jesuit presence, beginning in 1639, the first two to about 1642, the last two until 1650.

At this point we believed we had demonstrated that quick-growing native tobacco varieties, including by similarity *nicotiana rustica,* could be grown successfully from seed-to-seed within the growing season available in the Petun homeland. Now we hoped that the Delhi experiments would determine:
(a) if the pipe bowl residues included tobacco;
(b) the species or variety of any tobacco used;
(c) the nature of any organic additives;

On receiving the pipe bowls, Dr. Rosa immediately observed that the absence of visible tobacco and the state of decomposition of the residues would not allow the variety of tobacco to be determined, but that the question of whether the residues contained tobacco of any type could still be addressed by techniques able to detect the presence in the residues of the two major characteristic tobacco alkaloids, primarily nicotine, and secondarily nornicotine.

The tests were scheduled to be conducted in March 1973 (Nestor to Garrad, March 1, 1973). Meanwhile, Donald MacLeod, of the then Ministry of Natural Resources, reported that two pipe bowls with apparent tobacco residues had been recovered from two Huron sites BeGx-11 and BfGx-2 at Methodist Point, and asked the writer to include these in the tests. The residues were delivered to the writer in plastic vials, and passed to Dr. Rosa. In total, seven residues were tested, the seventh being a comparison control sample of modern pipe tobacco. This was necessary to determine in advance the chemical markers to be searched for.

On April 26, 1973, following the tests, Dr. Rosa telephoned the writer to advise:
(i) all four alkaloids conclusively characteristic of tobacco, nicotine, nornicotine, anabasine and anabatyne, were found present in all the submitted samples. The presence of tobacco is therefore demonstrated.
(ii) Spectrometer analysis could not determine what type of tobacco was present, nor what percent of the total mass was tobacco. The sample were highly contaminated with inorganic matter. The alkaloid analyses were achieved on a pyrolyser at 200°C. When raised to 650°C., the inorganic matter remained unaffected, and is believed to be sand.

Dr. Rosa subsequently (June, 1973) filed a written technical report on his analysis. This is attached to this document as an Appendix.

Although the analytic techniques were destructive, only a very small amount of each residue was required and consumed in the testing. The unused Petun residues were returned to the writer, and these, and others, remain available for future testing should the need and opportunity arise.

In discussion, Dr. Rosa also provided his insight into possible aboriginal tobacco horticultural practices compared with those of today. As previously noted, modern commercial tobacco, *nicotiana tabacum*, requires a growing season that is not available at the latitude of Ontario, and consequently necessitates prior germination in greenhouses, transplanting after the last frost, and special chemical fertilizers. In contrast, native tobaccos such as *nicotiana rustica*, may be planted as seed and should mature within the available growing season if planted in well-drained nutritious soil with a warm bottom. This removes any necessity for prior indoor germination, and in respect to Lyle Tait's proposal that prior germination in the longhouses would be possible, drew the conclusion that while indeed possible, it was not necessary, and for this reason was not done.

Conclusions

[1] The Petuns certainly used, possessed and smoked tobaccos, and were capable of growing certain tobacco varieties/species in the homeland under controlled and specific conditions.

[2] These conditions, which became apparent in the course of the experiments, are:
(i) the seed should be placed in well-drained soil with a warm bottom, and moderate-to-high nutritional value. Sand, and possibly wood punk, is too poor, and midden soil too rich. Clay-gravel and decomposed forest-floor muck were both successful.
(ii) the growing seedlings should be protected from frost, perhaps by being elevated on a mound, and placed in the lee of a building or other shelter from the wind.
(iii) the plant must be protected from animal and insect predators, and kept clear of grasses and weeds that would overcrowd it.

[3] the Petun did not practise prior indoor germination of seeds and transplantation of seedlings because it was not necessary.

[4] the usual frost-free season in the Petun homeland is adequate for the entire propagation (seed-to-seed) cycle of quick-growing varieties of tobacco to reliably occur. Mature smokable plants can be obtained even in poor seasons with late planting.

[5] The frost-free season in the Petun homeland varies in duration, being governed principally by elevation. In the valley-bottoms such as at Creemore and Websterville, the 1972 season was June 11 to October 8. The frost-free season suggested by Environment Canada, May 12 to October 12, might apply nearer to lakeshore, and to inland higher but protected elevations.

[6] Any organic smokable non-tobacco species added to tobacco to modify the rate of combustion, or the strength, are so entirely consumed during the smoking process that no detectable loss of weight occurs when smoked residues are subjected to great heat. It may still be possible to identify these additives using chemical techniques, but the diagnostic chemical markers to be searched for must be known in advance.

[7] Tobacco horticulture is both labour and care intensive. The seed cannot be simply planted and left to chance. Due regard must be given to a number of variable factors in site selection, preparation and subsequent care and protection.

Thoughts and Speculations

The fact that the Petun could themselves grow varieties of quick-growing tobacco does not remove the possibility that they also obtained tobacco in trade. Longer-growing varieties would necessarily be obtained from tribes in areas with longer-growing seasons, to the south.

Applying the above conclusions to what we think we know of Petun village life, it is apparent that the best place to grow tobacco would be within a village, in the shelter of a palisade or longhouse, to protect the young plants from the wind, for convenience of weeding, watering and the removal of insects, and the exclusion of animal predators. To prevent accidental damage from dogs and children trampling the mounds and running through the plants, tobacco-garden plots were probably fenced. The rows of small, closely-spaced stick-moulds found at, for example, the Sidey-Mackay BbHa-6 Site, and elsewhere, may be the remains of garden fences which had protected tobacco-growing plots.

Future Research

The possibility exists of testing residues for non-tobacco additives if the chemical markers to be searched are known in advance.

The absence of residues in Petun pipe bowls made of stone requires verification and explanation. All available specimens of stone pipes should be examined to eliminate sampling error. The writer would appreciate hearing from any Iroquoian specialist who has found, or knows of the finding of, smoked tobacco residues in a stone pipe bowl.

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Photo #1: Tobacco Research Station, Delhi, Ontario

Photo #2: (right) Jay Blair studying fully-grown specimen of quick-growing *Petit Havana* tobacco, which he cultivated in the garden behind his residence in Stayner, Fall 1972.

Photo #3: (below)
Jay Blair and Helen Hargrave with leaves of a mature tobacco plant, home-grown and cured by Helen Hargrave, part of which was subsequently smoked by William Ross, early 1973.

APPENDIX by Dr. Nestor Rosa

Analysis of Residue from Indian Clay Pipes

Samples submitted by Mr C Garrad

Samples of tobacco residue in Indian clay pipes were received for analysis of any chemical constituents that may produce significant information regarding its origin or type. Due to the state of decomposition it was agreed by consultation with Dr Weybrew, N. C. State University, Raleigh, N. C. that other than the possible verification that samples contained nicotine and nornicotine, the samples were decomposed to a state whereby type of tobacco could not possibly be determined

The following samples were received:

1) Residues intact in pipes

P/M - 5
P/F - 1
H/L - 1
GF - 1

2) Residues received in plastic vials

Befx11 (51)
BFGx-2 194

Methods of Analysis

Two techniques of measurement were used. (1) The standard method of determining total alkaloids in tobacco by steam distillation (Griffith steam distillation procedure) by UV absorption. This and measurement of the alkoloids expressed the total alkaloids as nicotine. (2) Gas-liquid chromatography of the pyrolyzed solid sample was also used.

A) Steam distillation

A small sample ≲ 70 to 200 mg) was weighed into a gelatin capsule and steam distilled by the Griffith procedure. Each distillate was then scanned for UV absorption through the range between 230 nm and 290 nm. The concentration was then determined and expressed as per cent total alkaloids as nicotine.

B) Pyrolysis Gas-liquid chromatography

The separation of nicotine and nornicotine was affected on a 5% SE-30 column with the solid support being chromosorb W, HMDS. The gas-liquid chromatograph

parameters were as follows: Carrier gas-nitrogen at 30ml/min., oven temperature 160° C for 3 minutes then programmed at 20° C/min. to 260° C. detector - 275° C, pyrolyzer - 175° C. Samples of tobacco of known nicotine and nornicotine content were pyrolyzed repeatedly until the retention time for the two compounds were established to be 132 and 376 seconds, respectively. The amount of each material was quantitated by a digital integrator.

Figure I, shows the UV spectra for the various samples. The spectra are characteristic for total alkaloids of tobacco and they differ only in magnitude. The concentrations of total alkaloids are summarized in Table I

Figure 2 shows the separation obtained for a sample pipe tobacco that was obtained from the ashes and residue of smoker's pipe. The spectra for the pipe residues were similar except that the actual quantities were less. The retention times however, were within 2 seconds of those shown in figure 2. The quantities of nicotine were expressed as counts per mg. sample. It is a relative figure only. Nornicotine was indicated only whether or not it was detected since pure nornicotine was not available for quantitation.

Table 1. Summary of observed total alkaloids as nicotine and nicotine by pysolysis

Sample	Steam distillation		Pyrolysis gas-chromatography	
	Wt. (mg)	% Total Alkaloids	Nicotine Counts/mg	Nornicotine
P/M-5	45.0	0.052	2300	+
P/F-1	79.5	0.044	1060	+
H/L-1	124.6	0.012	2120	+
GF-1			22,400	+
Befx-11 (51)	197.9	0.024	320	Trace
BFGx-2 (194)	167.5	0.023	+	Not detected
Check	75.9	0.668	93,500	

Summary

Samples taken from the pipes contained detectable amounts of nicotine and nornicotine. By visual appearance, the samples contained less sand or other soil material compared with the two samples, Befx-11 (51) and BFGx-2 (194) which were the residues obtained in plastic vials. It is quite probable that more sand or soil contaminants may have been introduced when sample was prepared. This however is strictly supposition since the two major alkaloids were found but to a lesser extent. The steam distillation also showed lesser amounts of the total alkaloids.

Spectral evaluation of the steam distillate of the residues and the pyrolyses evaluation verify that material in pipes contained alkaloids characteristic of tobacco.

Nestor Rosa

June, 1973.