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Tannin Production from Native Species of Sumac

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TANNIN PRODUCTION FROM NATIVE SPECIES OF SUMAC

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An investigation was conducted over a period of five years to test the hillculture crop value of various Iowa sumacs as erosion control and economic, tannin-producing plants. The latter phase included the study of the quality and quantity of tannin produced by comparing the species, analyzing the parts of the plants, interpreting the factors affecting the yield and conducting an experimental harvesting and processing project at the Hillculture Experimental Station near Floris, Iowa.

Four species of sumac growing in Iowa were chosen for observation and possible investigation. These species were *Rhus aromatica* Ait., fragrant or aromatic sumac, *Rhus copallina* L., black or dwarf sumac, *Rhus glabra* L. white or smooth sumac, and *Rhus typhina* Torn., staghorn sumac. Another related plant, *Toxicodendron radicans* (L.) Kuntze, poison ivy, might have been studied had this species been safe to handle. *Rhus trilobata* Nutt. occurs in a few places in Iowa but sufficient quantity of this species was not available for consideration. *R. copallina* was selected because it had been the most used by commercial tanners in the east. *R. glabra* was included because it seemed to have possibilities for production in Iowa due to its vigorous growth, large leaf and long leaf stem and petiole. Because *R. aromatica* and *R. typhina* appear abundantly in localized areas of Iowa, these two species were included in the project.

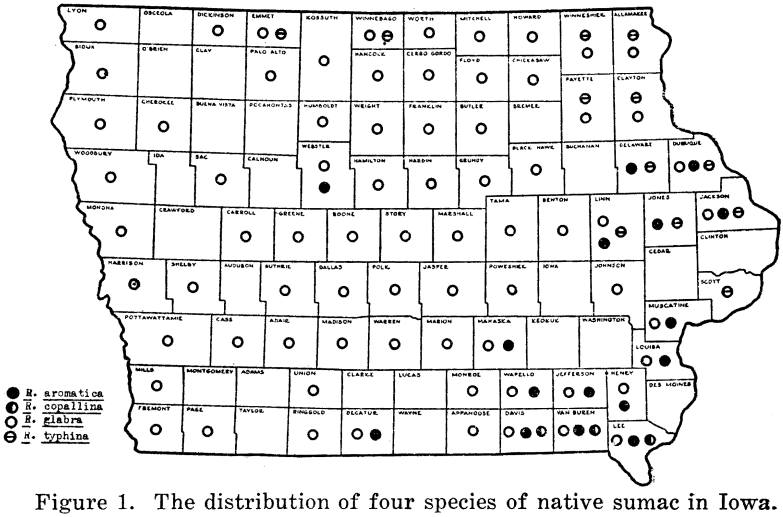

Figure 1. The distribution of four species of native sumac in Iowa. The county locations are based upon observations and records of specimens in the herbarium of Iowa State College.

For each year that samples were analyzed for tannin content, comparisons were made of the four species under observation. Table 1 shows the seasonal averages for each sumac species tested. *R. copallina* averaged higher in tannin content than did the other three species. The 1939 average was low as compared with the records of the other years for this species. This difference may be partly accounted for by the fact that all samples were taken late in the season when the tannin content is usually low, and that two-thirds of the samples were from one-year-old seedling plants. The tannin content of all seedling sumac, especially one-year plants, has been low as compared to that of adult sumac growth of the same species. *Rhus glabra* was second with an average of 26.6 per cent tannin for the five years. *R. typhina* ranked third. However, a large number of the clones tested of this species were growing under shade. *R. aromatica* always rated lowest. Very little significance could be placed upon the influence of shade on fragrant sumac since clonal variation in tannin content averaged very little higher for plants in non-restricted light than for those in shaded areas.

Table 1. The average tannin content on a dry weight basis of the four species of Rhus analyzed over a period of five consecutive years.

	Tannin per cent				
Species	1938[1]	1939	1940	1941	1942
Rhus aromatica	20.9	22.2	20.5	21.2	
Rhus copallina[2]	37.8	28.2	31.8	35.6	
Rhus glabra	28.9	26.3	25.0	26.5	26.3
Rhus typhina	24.9	24.5	23.2		

[1]Samples were taken from only four sources of which there was a 10 per cent variation in tannin content.
[2]Only leaflets were analyzed for the first three species. The petiole-rachis having been removed from all species except *R. aromatica*.

The average tannin content in the leaves of sumac tested was as follows: *Rhus aromatica*, 21.2 per cent; *R. copallina*, 33.4 per cent; *R. glabra*, 26.6 per cent and *R. typhina*, 24.2 per cent. During the time that this investigation was conducted 407 individual tannin analyses were made on various sumac clones. The results in percentage of tannin content of the leaves differed widely. The maximum and minimum percentages for each species were as follows: *Rhus aromatica*, 26.3 and 15.0; *R. copallina*, 39.6 and 22.9; *R. glabra*, 34.9 and 15.2 and *R. typhina*, 33.0 and 14.8 per cent respectively.

The two chief types of leather tanning are by vegetable and by chrome tanning methods. Vegetable tanned leathers are made with infusions and extracts of barks, woods, leaves, fruits and roots. The tanning material from sumac is obtained from the dried leaves. The stems or twigs of the plants are usually separated from the leaves during the harvesting process since the woody material is low in quantity and quality of tannin. The stems never averaged more than 5 per cent in tannin content.

Sumac is the best tanning material known for pale color and soft tannage, and therefore is used for moroccos, roans and skivers. It is

used also for brightening leathers of darker tannage, such as mimosa and gambier. Sumac-tanned leathers are considered to be less effected by light and gas fumes, and hence are better suited for bookbinding than the leathers tanned by any other known vegetable substance. Sicilian sumac (*Rhus coriaria*) has long been used to make the finer white leathers so much used for gloves and fancy shoes, while the American product has been used to tan darker leathers. One of the important reasons for the American varieties of sumac not having been used instead of the Sicilian sumac has been careless gathering and curing which causes the production of darker colored leather.

Sumac is widely distributed throughout the United States. *Rhus glabra* has been found growing in practically every state. This same species occurs all over Iowa. The map (figure 1) shows the location in the state of the four species of sumac under observation. The distribution of sumac in the counties of the state was determined by observation and from the specimens in the herbarium of Iowa State College. Absence of a species in any particular county does not necessarily mean that this sumac species is not growing in that county. Staghorn sumac was found to be growing in twelve counties of the north and east part of the state. This species is often used in ornamental plantings and seems to grow as well where it has been introduced as it does in its native habitat. Fragrant or aromatic sumac was found growing in the eastern and southeastern part of the state. Dwarf sumac was located in only three counties of the southeastern part of the state. In Lee County a clone was growing near Keokuk. One or more clones were located in Lacey-Keosauqua State Park in Van Buren County. A clone of this species was discovered last summer 2 miles northwest of Floris in Davis County.

Emphasis in the study was placed on *Rhus glabra* because the investigations indicate that it is the most promising sumac for tannin production in Iowa. This species is more widely distributed over the state than are any of the other three species discussed. Extensive clumps of smooth sumac are growing on waste and eroded areas in southeastern Iowa.

Native stands of sumac growing on rough terrain do not lend themselves to harvesting with machinery. Harvesting sumac by hand probably would never prove feasible in a mechanized, agricultural community. Sufficient investigations have been made to insure the successful propagation of smooth sumac in plantations of a magnitude large enough to provide profitable returns from this crop. Unless the sumac harvesting program could be made a community or cooperative project it would probably not be advisable for a farmer to invest in a harvester unless he had at least 50 acres of sumac which could be harvested.

Over a period of three years, collection of the leaves of smooth sumac were weighed from random areas to determine the yield. Table 2 shows the weights of these leaves calculated on an acre basis. In all cases the yield was more than one-half ton per acre and in 1941 the yield was almost one ton per acre. The harvesting in 1941 was done on August 3. As indicated in the table the maximum yield of leaf

material was obtained early in August. Leaves harvested in June produced a low yield because the plants were immature.

Table 2. Yield tests of airy-dry leaf material on smooth sumac taken at different times in the growing season

No. of clones harvested[1]	Area harvested (sq. ft.)	Date of harvesting	Yield of leaf on acre basis (lbs.)
4	256	June 27, 1940	1172
14	4781	August 3, 1941	1903
1	400	September 1, 1942	1634

[1]Only unit areas were selected from each clone. In no case was an entire clone harvested.

The introduction of sumac as a new crop into the agricultural program seems to have promising possibilities in the provision of raw material for a basic industry, additional revenue to the farmer, the reduction of surplus in other crops and better land use in prevention of soil erosion.

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