BRIEF PAPERS

THE HOTTENTOT FIG AS A POSSIBLE COMMERCIAL SOURCE OF TANNIN

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Domestic sources of drugs, always potentially important, have increased significance in time of war when foreign markets are unavailable or nonexistent. With this thought in mind, a preliminary examination was made of *Mesembryanthemum eduli* L., commonly known as the Hottentot Fig, as a possible source of tannins. The great astringency of the sap which can be readily demonstrated by the simple expedient of drawing lightly the freshly cut surface of a leaf across the tongue, suggests the presence of relatively large amounts of tannin in this plant. The species, a native of the arid plains and sands of South Africa, has spread to many parts of the world and thrives in dry, rocky or sandy soils where, due to its prostrate habit of growth, it forms dense succulent mats. Material for the present work was collected on the grounds of the University of California Medical Center.

Freshly collected leaves and stems were dried to constant weight at 120° C. Then the material was extracted with twenty volumes of water at 50 to 60° C. for thirty minutes. Filtration of the resultant solution yielded a light amber-colored and slightly opaque liquid which was tested with FeCl₃, neutral and basic lead acetate. The slightly acid reaction of the filtrate, the green coloration with FeCl₃ and precipitation with lead acetate all pointed to the presence of tannins. Further tests made with lead acetate and bromine water showed that the tannin in *Mesembryanthemum eduli* is of the catechol or phlobotannin type. Although the pyrogallol tannins have found more general industrial applications, the catechol tannins can be used extensively also in many industrial processes, including the tanning of leather. The exact nature of the leather produced can be determined only by experimentation, however. It seems entirely possible that different classes of leather can be produced by using this tannin in conjunction with other materials.

Quantitative analysis of oven-dried *Mesembryanthemum* showed 19.4 per cent. tannin in the leaves, and 14.16 per cent. in the stems. Analysis of mixtures of stems and leaves revealed 17.1 per cent. tannins. The material used in these tests was collected during June and July, and it is not known how these percentages might vary at different seasons. It is apparent that the difference in tannin-content between the leaves and mixtures of the leaves and stems is not sufficient to warrant the use of leaves exclusively if the plant is to be considered as a possible commercial source of tannin, since separation of the leaves from the stems is a tedious and time-consuming task.

The analysis indicates that *Mesembryanthemum eduli* is a good potential source of tannin. It is widely distributed in sandy and rocky regions of the
Central and Northern California coasts, where it forms dense and extensive mats. The thick and heavily cutinized fleshy leaves, which resist drying, enable it to endure severe drought; but the plant grows readily also in a relatively moist atmosphere like that of San Francisco, provided the soil is sandy and is well-drained. It satisfactorily withstands some frost and is easily propagated from cuttings, even in relatively poor soil. All of these factors would be advantageous in commercial production of the plant. The fact that it thrives on marginal land and does not require rich agricultural land is an added asset. On the basis of existing stands, it is estimated that under average growing conditions about fifty to sixty tons of the fresh plant might be harvested per acre. This should yield approximately 1500 pounds of tannin.

The moisture content of the plants (leaves and stems) determined by drying the material to constant weight was 92.9 per cent. and the total ash constituted 1.39 per cent. of the fresh weight.

The sap of Mesembryanthemum eduli has been reported to have antiseptic properties.¹ Accordingly, the sap and aqueous extract of the leaves were tested for bacteriostatic or bactericidal activity, using ordinary bacteriological methods and Staphylococcus aureus as the test organism. The tests failed to reveal any outstanding antiseptic properties in either the sap or the aqueous extracts, although some indication of slight bacteriostasis was observed. Currently, much attention is directed toward surface-tension depressants as bactericidal agents, and it is interesting to note in this connection that the sap and aqueous extracts of Mesembryanthemum both have a significantly lower surface tension than water. The average value observed was 59 dynes/cm., whereas distilled water at the same temperature had a value of 72 dynes/cm. Both the bacteriostatic and surface-tension depressant properties of the sap and the aqueous extracts of Mesembryanthemum can probably be attributed to its tannin content. The phenolic nature of tannins is sufficient to give a slight bacteriostatic effect; and the lowering of the surface tension may be due to the tannin and/or a saponin, the presence of which was definitely established.

In view of its properties, it may be suggested that perhaps the sap or crushed leaves of Mesembryanthemum eduli can be used as an emergency application in the treatment of burns and minor cuts. The slight antiseptic activity together with the astringency seem to present a very satisfactory combination.

Summary

Mesembryanthemum eduli is potentially a good commercial source of tannins of the catechol or phlobotannin type, dry leaves and stems containing, respectively, 19.4 and 14.16 per cent. Mixtures of the two yield 17.1 per cent. tannin and it is estimated that average stands of the plant in California should yield about 1500 pounds of tannin per acre. The tannin in Mes-

¹ HOBBS, C. E. Botanical hand book of crude vegetable drugs. 271 pp. + supplement. 1876.
embryanthemum eduli could be used in the manufacture of leather, yielding leathers without bloom; and it is probable that in conjunction with other tannins or materials, different classes of leather could be produced. The sap and aqueous extract of the plant have mild antiseptic properties. The great astringency and mild antiseptic properties seem to afford a potentially useful therapeutic combination.

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