

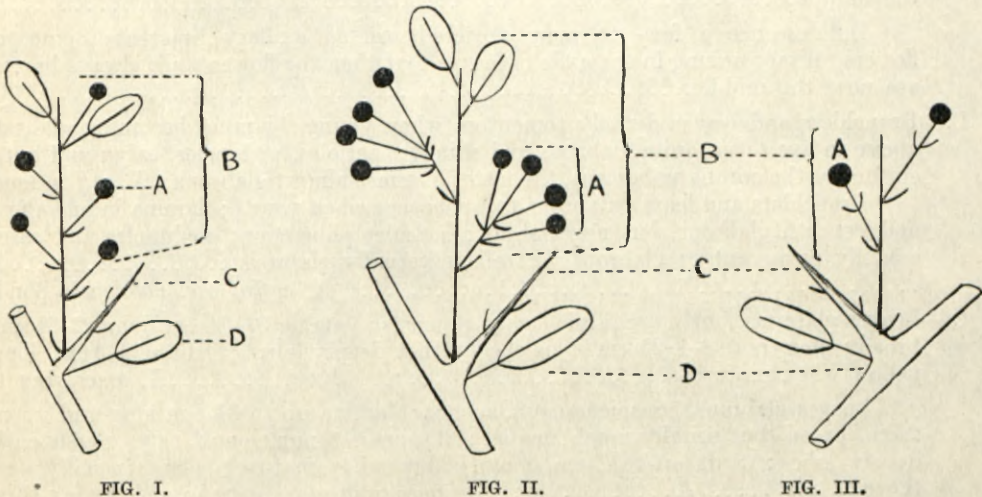
A NOTE ON THE SOUTH AFRICAN SPECIES OF *XIMENIA* LINN. AND THEIR POSSIBLE ECONOMIC USES.

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DURING the past seventeen years spasmodic interest has arisen in connection with the possible use of the fruits of species of *Ximenia* as a source of oil. In 1917 the Imperial Institute reported on a sample of fruits said to be those of *X. americana* Linn. Last year Mr. A. G. S. du Toit, the Extension Officer at Ixopo, Natal, sent in specimens of a *Ximenia* (National Herbarium No. 16694) accompanied by a large sample of fruits, with a request for any information as to their economic value. Mr. du Toit in his letter stated that the plant grows on very poor dry land—practically useless for any other plant of value and that the fruits could be gathered in large quantities. In South Africa we have two species of *Ximenia* which have always been confused and because of the interest taken in the plants, it was thought desirable to clear up the confusion, as it was important to know which of the two species were investigated and reported on by the Imperial Institute. The work was commenced at the National Herbarium, Pretoria and completed at the Herbarium, Royal Botanic Gardens, Kew.

Oliver in the Fl. Trop. Afr. 1, p. 346 (1868), mentions one species, *X. americana* L. and one variety, *X. americana* var. *microphylla* Welw. Sonder in the Fl. Cap. 1, p. 234 (1859), likewise mentions only one species *X. caffra* Sond. and one variety, *X. caffra* var. *natalensis* Sond. The fundamental difference between *X. americana* L. (and the variety *microphylla* Welw.) and *X. caffra* Sond. (and the variety *natalensis* Sond.) may be found in the type of inflorescence.

The following diagrammatic drawings may serve to illustrate the morphology of different types of inflorescences met with in the South African species and varieties of *Ximenia* L. For the sake of clarity these diagrams have been somewhat exaggerated especially with regard to the dimensions of the abbreviated shoots (B) in Figs. I. II. III.



In *X. americana* the inflorescence is always a stalked axillary few- to many-flowered bracteate cyme. In *X. americana* var. *microphylla* the inflorescence is also a few-flowered stalked and bracteate axillary cyme; occasionally however, the flowers may be solitary, but then the peduncle is always bracteate, thus suggesting a reduced inflorescence. In *X. caffra* and *X. caffra* var. *natalensis*, however, each flower arises singly in the axil of either a scale-like leaf or in the axil of a normally developed leaf; the pedicels are never bracteate. A number of these flowers usually arise on one and the same much abbreviated lateral shoot thus forming an axillary fascicle. By the foregoing characters *X. caffra* (and its variety) may readily be distinguished from *X. americana* (and its variety).

A study of herbarium material has shown, that the inflorescence Fig. II (A), or solitary flowers Fig. I and Fig. III arise in the axils of either (i) normally developed foliage leaves, or (ii) in the axils of reduced scale-like leaves borne by shoots of limited growth (B). These dwarf shoots (B) are usually much abbreviated and consequently the fascicles of flowers in *X. caffra* (and its variety) may readily be mistaken for sessile axillary cymes. The abbreviated shoots in turn arise in the axils of either (i) normally developed foliage leaves, or (ii) in the axils of the lower scale-like leaves, on lateral branches of limited growth (C); the latter may either be so much abbreviated as to resemble warty outgrowths or may be relatively well-developed thorns. The thorns invariably arise in the axils of normally developed leaves (D). The latter may have fallen by the time the inflorescence develops, but this is by no means always the case. Furthermore the leaves on the shoots (B in Figs. I and II) do not always develop and consequently may be absent. In other cases again the bracts subtending the flowers (Fig. I) or those subtending the cymes (Fig. II) may be replaced by normally developed leaves.

Burt Davy in his Manual of Flowering Plants and Ferns of the Transvaal with Swaziland II, p. 453 (1932) seems to have overlooked the fact that *X. americana* L. and *X. caffra* Sond. are readily distinguishable by their type of inflorescence. In fact this character is of fundamental importance in the distinction of species (and varieties) belonging to this genus.

It is therefore suggested that the following key to the Transvaal species (and varieties) be substituted for the one on page 453 of Burt Davy's manual (l.c.)

A.—Flowers solitary in the axils of normal or scale-like leaves, or in few- to many-flowered fascicles on abbreviated branches. Flower-stalks never bracteate near the middle.....B.

Inflorescence a few- to many-flowered stalked axillary bracteate cyme, or flowers solitary arising in the axils of leaves, but then the flower-stalk always bracteate near the middle.....C.

B.—Branchlets and leaves densely tomentose when young; lamina becoming glabrate above in age (even quite glabrous and shiny); petioles, peduncles, calyx and outer surface of the corolla pubescent, the latter at times almost glabrous. *X. caffra* Sond.

Branchlets and leaves glabrous to tomentose when young; lamina in age above and beneath glabrous, but never shiny; petioles pubescent; peduncles and calyx scantily pubescent or glabrous; corolla externally glabrous.....
.....*X. caffra* var. *natalensis* Sond.

C.—Leaves glabrous, but not conspicuously glaucous; lamina 3½–7½ cm. long, 2–3½ cm. broad; flowers 0.8–1.25 cm. long; calyx not deeply lobed; fruits 2½–3 cm. long, yellow when mature.....*X. americana* L.

Leaves glabrous, conspicuously glaucous; lamina up to 3½ cm long and up to 2 cm. broad, but usually much smaller; flowers 5–6 mm. long; calyx persistently deeply lobed; fruit up to 2 cm. long, yellow when mature; plants usually very thorny.....*X. americana* var. *microphylla* Welw. ex Oliv.

According to Burt Davy l.c., *X. americana* L. occurs in the bushveld and Barberton areas of the Transvaal. Examination of specimens quoted in his manual, has proved these to belong to *X. caffra* var. *natalensis* Sond. As it may easily be seen from the above key that the latter plant is entirely distinct from *X. americana* L., Burt Davy's synonymy *X. americana* L. = (*X. caffra* var. *natalensis* Sond.) is not justified; it is merely the result of erroneous identification of specimens. Furthermore in the "Notes from the National Herbarium and Museum, Series No. 4, Journ. Dept. Agr., South Africa, January, 1925" the plant in question (Nat. Herb. No. 2840) is definitely not *X. americana* L. but *X. caffra* Sond.

All the available material from the Transvaal I have so far had an opportunity to examine, did not include any belonging to *X. americana* L. This species in its typical form apparently does not occur in the Transvaal or even in the Union of South Africa.

With regard to *X. Rogersii* Burt Davy: This species is described by Burt Davy in his Manual 11, p. xxxv (l.c.). A description of the inflorescence is not given. Examination of the type specimen (*Rogers* 22569 in Herb. Kew.) showed, that it agrees perfectly with the type of *X. americana* var. *microphylla* Welw. ex Oliver (*Welwitsch* 1127 in Herb. Mus. Brit.). Burt Davy does not, however, quote this variety as a synonym of his species *X. Rogersii*. Whether the plants placed in *X. Rogersii* and therefore also those placed in the variety of *X. americana* are sufficiently distinct from *X. americana* to constitute a separate species is at present difficult to say. They are undoubtedly closely allied to that species and the only character by which they may be readily distinguished appears to be the difference in length of the petals of the flowers. Until more complete material, better field-notes and a much wider range of material can be studied it is perhaps more satisfactory to retain *X. americana* var. *microphylla* Welw. ex Oliver in preference to *X. Rogersii* Burt Davy. It is also suggested that the enumeration of species and varieties of *Ximenia* L. on p. 453-454 of Burt Davy's Manual be modified as follows:—

- (1) *X. caffra* Sond.
- (2) *X. caffra* var. *natalensis* Sond.
- (3) *X. americana* var. *microphylla* Welw. ex Oliver = (*X. Rogersii* Burt Davy).

The fruits sent to the Imperial Institute in 1934 were those of *X. caffra* var. *natalensis* (National Herbarium 16694) and examination of the herbarium material now proves that the samples of fruits examined by the Imperial Institute in 1917, were not those of *X. americana* but of *X. caffra* (National Herbarium 2840).

The following is an extract from the report of the Imperial Institute:—

"As previously mentioned it seems unlikely that the oil could be prepared by pressing the kernels, and solvent extraction would be necessary. The oil obtained in the present case by extraction with light petroleum resembled the similarly-prepared oil from the *X. americana* (i.e. *X. caffra*) kernels in being viscous and cloudy, and in containing an appreciable quantity of a rubber-like constituent, the presence of which would account for the high viscosity of the oil. Such oil could not be used for edible purposes and would probably prove unattractive for the manufacture of soap in competition with other readily available oils. Its comparatively low iodine value indicates that it would be unsuitable for use in paint and varnish-making. The acetone-extracted oil, on the other hand, proved to be practically free from the objectionable rubber-like substance. It might therefore prove more suitable for soapmaking and possibly, after refining, for edible use. The value of such oil at the present time would, however, be only about £13 to £14 per ton in the United Kingdom. The residual meal is rich in proteins, but feeding trials carried out in Germany on several kinds of animals with the residual meal of *X. americana* kernels are stated (*Der Pflanzler*, 1911 7, 486) to have shown that the meal is not well suited for use as a feeding-stuff. The present meal would probably give similar results, but feeding trials would be necessary

to determine this point. In this connection it may be pointed out that the meal left after extraction with acetone would contain most of the rubber-like constituents of the kernels, and this might affect its suitability for use as a feeding-stuff. Owing to the inferior quality of *Ximenia* kernels in comparison with other oil-seeds and in view of the current over-production of vegetable oils generally and the consequent low price of these commodities, it does not appear likely that under existing conditions it would be profitable to exploit *Ximenia* kernels as a source of oil, except possibly for local markets. It may be mentioned in connection with any effort which may be made to utilise *Ximenia* oil in South Africa, that the kernels can be readily extracted from the dry fruits by treatment in a Miller's palm-nut cracking machine, and subsequent separation by means of sieves and an air-blast such as are employed in machines used in the preparation of palm kernels."