SHORT COMMUNICATIONS

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A NOTE ON PAKISTANI ARTEMISIA

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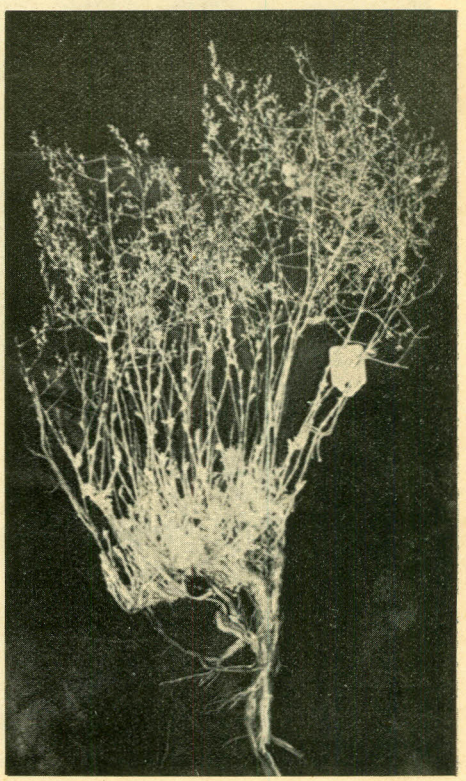
Pakistani artemisia has, on account of its high santonin-content, come into great prominence in the world drug market. Pakistan is the largest artemisia producing country in the world, and indigenous santonin-containing species grow very abundantly, covering extensive areas. There are two important sources of commercial supply—the Upper Kurram Valley and the north-western Kashmir in the Gilgit Agency, the available natural resources of each of which is capable of satisfying the entire world need of santonin. No other country can, in the present circumstances, compete with Pakistan in regard to the production and supply of good quality artemisia. In the case of Pakistan artemisias, the botanicals grow wild in nature and no special care or expense is involved in growing them.

The Kurram and the Kashmiri artemisias botanically belong to two distinct species. While the Kashmiri artemisia is *Artemisia brevifolia Wall*, the Kurram artemisia was discovered by the author in 1926, and the history of its discovery is given elsewhere.[1,2] The Kurram artemisia is named *Artemisia kurramensis Qazilbash*.[3] The two artemisias differ from *Artemisia maritima L* morphologically, ecologically and genetically.[4] They are also distinguishable from *Artemisia maritima* as regards geographical distribution, nutritional requirements and photoperiodic responses.

Artemisia brevifolia Wall., bearing flower heads in different stages of growth.

Flowering shoots of *Artemesia brevifolia Wall*, showing flower-heads at different stages of growth.



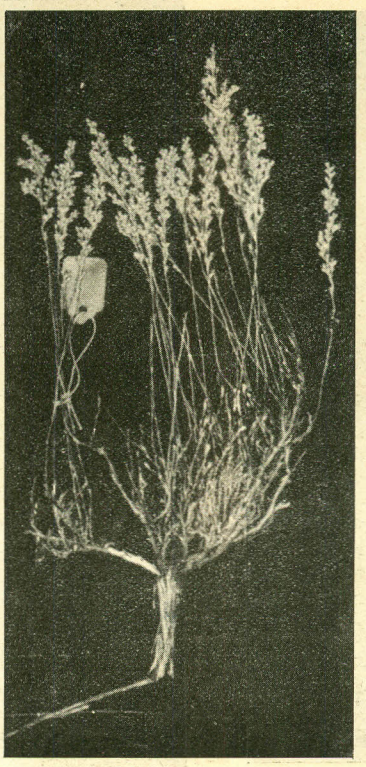
A fully developed plant of *Artemisia kurramensis Qazilbash* growing wild.

Artemisia maritima L typically is a halophyte, which flourishes in saline soil. *Artemisia kurramensis Qazilbash* is a xerophyte, which flourishes in alkaline loamy soil. Salinity in the soil adversely affects the healthy growth of *Artemisia kurramensis Qazilbash*. Plants of *Artemisia maritima L* raised from imported seeds did not do well in the alkaline loamy soil of Peshawar and ultimately died.

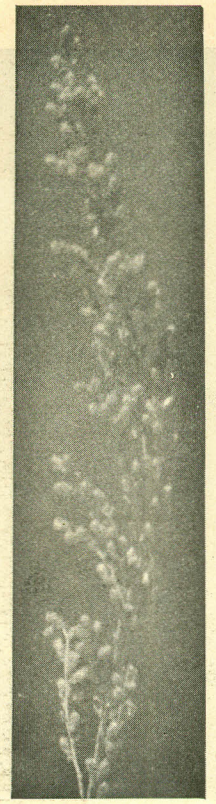
Artemisia maritima L in typical cases is a hexaploid. The number of chromosome is n=27 and 2n=54. *Artemisia kurramensis Qazilbash* is a diploid. The number of chromosome is n=9 and 2n=18. It is interesting to note in this connection that hexaploids derived artificially from *Artemisia kurramensis Qazilbash*, on treatment with acenaphthene, resembled *Artemisia maritima L* morphologically as well as genetically in all important respects. The artificially produced plants were sent to Kew Botanic Gardens for confirmation. They were identified as similar to *Artemisia maritima L*. The experimental procedure adopted in producing the hexaploids of *Artemisia kurramensis Qazilbash*, resembling *Artemisia maritima L*, is described elsewhere.[5] Nevertheless, it appears that Chaudri[6] has confused *Artemisia kurramensis Qazilbash* with *Artemisia maritima L*. His conclusion is arbitrary and is not based on any original judicious scientific studies. *Artemisia kurramensis Qazilbash* is now universally recognised as a well marked distinct species, and its systematic independance is fully established.[7,8,9] It has aroused great interest all the world over on account of its high santonin content.

In the Gilgit Agency, santonin-containng artemisia grows in the Rattu area, Gurez, Kamiri and its adjoining territories in the north-western Kashmir.[10] Artemisia covers vast areas of elevated plateau lands and mountain slopes. In the Kurram Agency also, artemisia grows wild in desert areas and is commonly met with around cultivated lands. It flourishes very well on the ridges of cultivated fields, where it can get some irrigation water, and without any additional cost, avail of the manurial treatment, necessary for the regular field crops. Lately the cultivation of artemisia has been largely extended to regular fields. Such a practice however

Artemisia brevifolia Wall., showing roots, and flowering shoots. Locality, Sissu-Khoksar. Altitude, 11,000 ft.

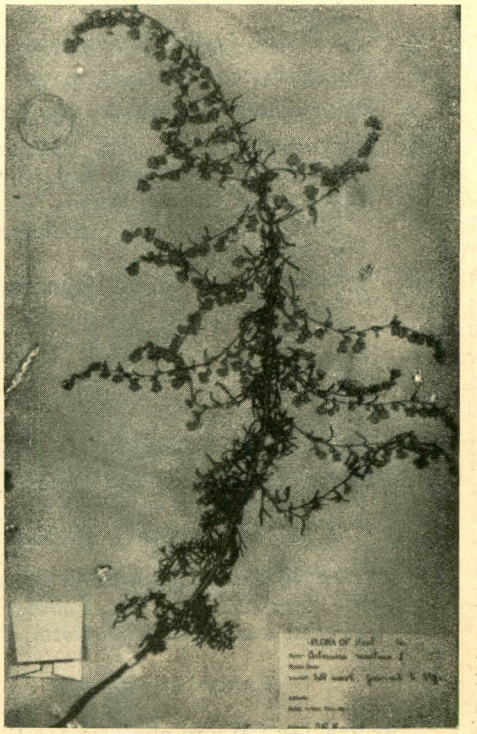


A fully developed plant of *Artemisia kurramensis Qazilbash* growing in a cultivated field.

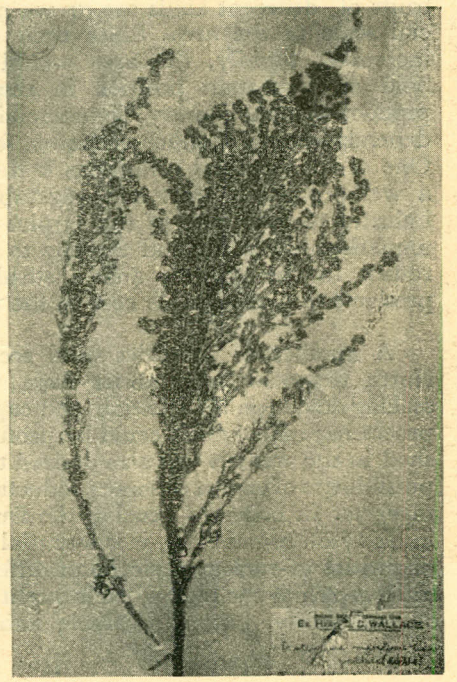


A flowering shoot of *A. K. Qazilbash* bearing fully developed heads.

is undesirable in the present economy of the country, because it adversely effects the production of much-needed cereals and other cash crops, and unnecessarily promotes the overproduction of artemisia to the great disadvantage of the growers. In view of the demand for santonin and the availability of the drug from other geographical sources, it is imperative that the production of artemisia be restricted within reasonable limits. It is also important for the survival of the artemisia industry that measures should be adopted for growing only selected high-grade artemisia in suitable areas provided with the best cultural conditions. For this purpose, proper selection and breeding of the strains with best santonin-content are essential. Propagation of newly evolved physiological strains with highest santonin-content is most desirable for successful competition with scientifically advanced and industrially highly developed foreign countries. For commercial cultivation of artemisia, it is essential that due regard should be paid to the best environmental conditions, which directly or indirectly are conducive to the development of higher santonin content. Soil fertility, soil humidity, atmospheric humidity, light and temperature effects are important basic cultural factors.



Artimeria maritima L.



Artimeria maritima L.

For successful competition with other countries, it is also very important to adopt more economical methods of harvesting. The present practice of assorting the collections already freed from woody pieces of stems and branches into A, B and C grades is hardly necessary especially when material of all grades is to be utilized for manufacturing santonin. It is quite an expensive, time consuming and laborious affair. If the manufacture of santonin is taken up locally, the dried tops freed from thick woody pieces of shoots could be utilized directly for processing. This will undoubtedly cut down the expenses to a considerable extent, and much labour and time will be saved.

The extraction of crude santonin could conveniently and cheaply be taken up locally by the lime and water process. In this proceas, the roughly powdered raw material, mixed up with slaked lime is boiled with water and filtered, the filtrate is concentrated and then treated with dilute hydrochloric acid, the acidified solution being allowed to settle down and to form a resinous sediment. The sediment is collected, mixed up thoroughly with powdered charcoal and allowed to dry gradually by stirring with a rod, the dried powdery mass being then packed in suitable containers and sent out for the manufature of refined pure santonin.

If the processing of crude santonin were taken up locally, the transport charges would be cut down to a very large extent. At present, there is no control on the growing of artemisia in the Kuram valley. Different strains of artemisia with low and high santonin content are grown together. Production in approved areas could be much

improved qualitatively and quantitatively by judicious use of commercial fertilizers and the application of improved modern techniques and methods of breeding in propagating the best physiological strains of high quality artemisia. Natural fertilizers used occasionally by the local growers are not quite adequate for satisfying fully the basic needs of the soil. It is most important to keep the soil in a healthy productive condition, and adequate administration of ammonium sulphate has remarkably improved the yield qualitatively as well as quantitatively.

Japanese santonin has lately appeared in the drug market, the botanical source of the raw material being *Artemisia matritima L* growing on Hokaido islands. The seeds were brought in 1925 from Thuringen (Germany), where *Artemisia maritima L* is cultivated for the supply of raw material for the manufacture of santonin in Germany. *Artemisia maritima L* growing on Hokaido islands is much inferior to *Artemisia kurramensis Qazilbash* in respect of its santonin content, and attempts are now being made to grow *Artemisia kurramensis Qazilbash* in Japan. The work is progressing under controlled experimental conditions, and has so far reached only a limited commercial scale.

At present there are two factories in Pakistan engaged in the manufacture of santonin—one at Rawalpindi and the other at Quetta. The santonin factory at Rawalpindi has a refining capacity of producing 5,000 - 6,000 kilograms of santonin. Santonin is a valuable althelmintic for the elimination of intestinal round-worms. Several other drugs have been used as substitutes from time to time. Santonin has, however, stood the test of time and has upto this day maintained its sovereign position among the remedies for the elimination of intestinal round-worms. Santonin still enjoys universal popularity and is regarded as a cheap reliable drug of well established value and repute. The biggest competitor of Pakistan in the world drug market is the U.S.R.R. The seriousness of the situation should be fully realized and every effort should be made to preserve and promote the healthy growth and development of the artemisia and santonin industries in Pakistan, as a long range issue. For this purpose well organised research of a high technical standard is most urgently needed. The need of the time is to improve the quality of artemisia and to adopt more economical and uptodate methods of santonin manufacture.

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A SURVEY OF FRUITS IN THE NORTH-WESTERN REGIONS OF WEST PAKISTAN

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As varying soil and climatic conditions are met within the north-western regions of West Pakistan, fruits of different kinds are grown on a commercial scale in the area. Since their cultivation is increasing rapidly, the area would continue to hold an important position in respect of fruit production in the country. Commercial fruit growing depends upon a number of factors for its success. One of the essential conditions is the presence of a well-organised fruit and vegetable processing industry to take care of the surplus or otherwise unmarketable fruits, and thereby to ensure a fair return to the growers and a steady supply of products at a reasonable cost to the consumers.

A number of enquiries were received in the North Regional Laboratories from industrialists seeking advice on the location and capacity of fruit processing units which could be profitably established in the area; it was also desired to explore the possibilities of export of some products to European markets. In order to develop the fruit processing industry on sound lines, it is essential to know the quantities of various varieties of different kinds of fruits grown in the region, their quality and season of availability, but no reliable information was

available from any source in this respect. A detailed fruit survey was, therefore, undertaken to collect reliable data in respect of fruits grown in the region and thus be able to recommend establishment of new fruit processing factories in the area. The survey has now been completed in the Peshawar district. The data collected reveal the following:—

1. Fifty four varieties of different fruits are commercially grown in the district.

2. The total area under fruits is 13,743 acres and the total annual production is 28,50,960 maunds, distributed as below among the three tehsils.

Peshawar Tehsil: area, 5580 acres; production, 11,83,512 mds.

Charsadda Tehsil: area, 2583 acres; production, 6,58,818 mds.

Nowshera Tehsil: area, 5580 acres; production, 10,08,630 mds.

3. Plums, pears, oranges and peaches are the main fruits grown in the district. Other fruits like "loquat," grapes, pomegranate, figs, apple, quince, apricot, banana and dates are grown on a limited scale.

4. The annual production of plums, pears, oranges, peaches and other fruits is 12.23, 8.66, 4.11, 1.25 and 2.26 lakh maunds, respectively.

5. A number of varieties of each fruit are under cultivation. The leading varieties are:—

a) Plums: Fazl-e-Manani and Formusa.
b) Peaches: 6-A
c) Pears: Leconte and Batang.
d) Oranges: Red Blood and Local White.

6. Only 0.23 percent of the fruit product (in the district) is annually utilised for processing by the existing factories. The remaining quantities are sold fresh.

7. The present area under fruits works out to 3.5 percent of the total area sown in the year 1956-57.

8. Area under fruits has been increasing steadily. A further increase of about 7,000 acres is expected in a few years when an additional 2 lakh acres of land would be brought under irrigation as a result of various irrigation projects nearing completion.

The above survey has clearly indicated that steps should be taken to utilise larger quantities of fruits for processing. Products should be manufactured for use within the country as well as for export. This work would be taken up in the North Regional Laboratories in the near future when necessary equipment is received.

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A NEW SPECIES OF ALTERNARIA ON CASSIA HOLOSERICEA FRESEN

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(Received October 10, 1959)

In January 1959, a specimen of diseased leaflets of *Cassia holosericea* was collected from Hub River Road near Karachi. The affected leaflets showed a few scattered spots on both the surfaces of the leaflets, irregularly round or elongated, light to dark brown and bounded by a slightly raised margin, rather deeper in colour. The spots, which are at first small, brownish and 0.5 mm. to 2 mm. in diameter, gradually enlarge, becoming ultimately as big as 0.8 to 1 cm. in diameter, irregularly zonate and covered by the dark fructification of the fungus belonging to the genus *Alternaria* (Fig. 1).

Fig. 1.—Leaflets of Cassia holosericea affected by *Alternaria cassiae*.

Conidiophores in tufts, straight or slightly curved, septate, simple or branched, measure 36.0-112.0 × 16.0-24.0 μ. Conidia obclavate, muriform, smooth, light to dark-brown, with the beak subhyaline, slightly constricted at the septum measuring 92.0-332.0 × 28.0-40 μ (Figs. 2 and 3).

A review of the literature showed that no species of Alternaria has so far been reported on *Cassia holosericea* from any part of the world. Therefore the species under study was suspected to be new. This was later confirmed by the Commonwealth Mycological Institute, Kew, Surrey, England. The name *Alternaria cassiae* is being proposed for this species which is described below:

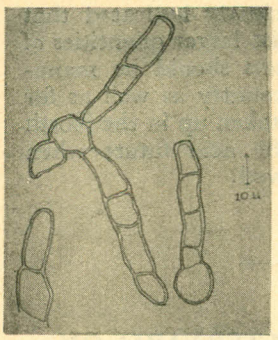

Fig. 2.—Conidiophores.

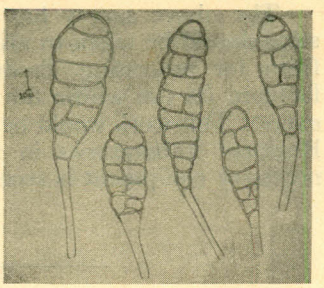

Fig. 3.—Conidia.

Alternaria cassiae spec. nov.—Maculae rarae, dispersae in utramque paginam foliolorum, irregulariter circulares vel elongatae, pallide vel fusce brunneae, circumdatae margine paulum elevato sat fusco colore diametientes primum 0.5-2 mm. gradatim evadentes latiores usque ad 0.8-1 cm. diam. zonis irregualribus ornatae atque opertae fructificationibus fuscis. Conidiophori glomerati, recti vel tenuiter curvati, simplices vel ramosi, septati, magnit 36.0-112.0 × 16.0-24.0 μ. Conidia obclavata muriformia, laevia, pallide vel fusce brunnea, rostro subhyalino ornata constricta ad septa, magnitud 92.0-332.0 × 28.0-40 μ.

Habitat: On the leaves of *Cassia holosericea* Fresen collected on 11.1.59.

Locality: Hub River Road near Karachi. Collected by A.M.M. Jurair.

Type specimen: Deposited in the University Herbarium, Karachi (No. 564), Co-type deposited in Herbarium Commonwealth Mycological Institute, Kew, Surrey, England under No. 75872 for record.

The authors are highly indebted to Dr. S.Z. Hasanain, Head of the Department of Botany, University of Karachi, for providing all facilities and encouragement; to Father H. Santapau, S. J., Professor of Botany, St. Xavier's College, Bombay, for the Latin description of the fungus reproduced above; and to the Director, Commonwealth Mycological Institute, Kew, Surrey, England, for confirming the identification.

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A NOTE ON THE OIL CONTENT OF SOME KARACHI SARDINES

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Introduction

Information on the composition of fish is of basic importance to the solution of a large number of problems in the field of fish technology, and is essential for taking a decision on adopting any particular method of preservation, or using it as food or preparing industrial products from the whole fish or its wastes.

Since the compsotition, especially the oil content of fish shows wide variation depending

TABLE 1.—PROXIMATE COMPOSITION OF SARDINE, GREY MULLET, DRUMS AND SEA BREAMM.

Name of the species	Local name	Popular English name	Proximate composition							
			Protein (N×6.25)		Ether extract or Fat		Total ash		Moisture	
			Range	Average	Range	Average	Range	Average	Range	Average
Sardinella sindensis	Tarli	Sardine	18.5-19.0	18.7	1.0-3.0	2.0	1.3-2.2	1.7	76.5-78.9	78.0
Sardinella longiceps	Dome	Sardine	18.5-22.0	19.5	1.2-4.9	3.0	2.0-2.5	2.1	71.6-76.8	75.5
Otolithes ruber	Mushka	Drums or Croakers	16.5-18.2	17.2	0.9-1.3	1.0	1.2-2.5	1.3	75.5-78.5	77.5
Mugil speigleri	Boi	Grey Mullet	20.5-22.5	21.0	1.0-2.3	1.8	1.5-2.5	1.7	74.3-77.1	75.4
Chrysophrys sp.	Dandia	Sea Bream	19.0-20.8	20.0	1.3-2.8	1.9	1.5-2.5	1.9	70.9-74.5	74.0

upon the environmental conditions, seasons and other factors, the proximate composition of five species of locally available small fish along with some preliminary findings on the seasonal variation in the oil content of sardine are presented in this paper.

Methods and Material

Proximate analyses were carried out on each sample using standard techniques of the Association of Official Agricultural Chemists.[1] The fish used for these analyses were obtained from the local market and all the determinations were made on fresh unpreserved fish.

Results and Disccusions

The aproximate composition (protein, oil, ash, and moisture) of five varieties of small fish of an average length of six inches is shown in Table I, and some data on the seasonal variation in the oil content of sardine are given in Fig. I.

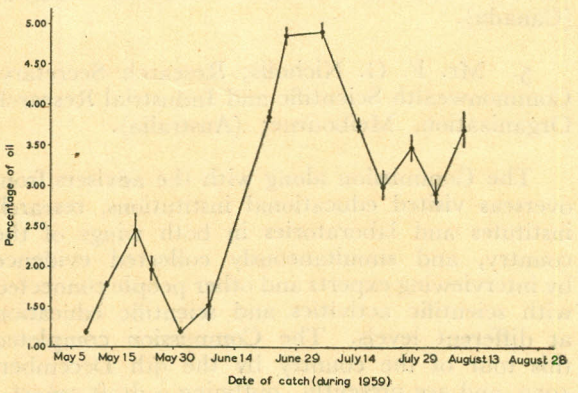

Fig. 1.—Seasonal variationa in the oil contedt of Sardine (*Sardinella longiceps*.

It will be seen from Table I that though the range of protein content in all the species of fish is fairly small, the oil content varies appreciably. The variation is the largest in the case of oil sardine (*Sardinella longiceps*) when it varies from 1.2 to 4.9. It will also be seen that the average oil content of sardine is much higher than the other three species analysed. This species (No. 2) also contains a high percentage of ash. Various experiments by other workers[2,3,4] have also shown that all constituents of fish change proportionately from time to time, but the constituent that undergoes the greatest changes is the oil or fat. This is due to the fact that many species of fish when feeding store oil as a reserve, to draw upon it later in the breeding season or migration. Such fish generally migrate over vast distances, and during these migrations they derive their energy from the fat reserve. This is the cause of seasonal variations in fat content. A summary of the observed seasonal variation in the oil content of sardine (*Sardinella logiceps*) is shown in Fig. 1. The maximum oil content as determined during the months of May, June and July was 4.9%. According to the classification of oily and non-oily fish, *Sardinella longiceps*, as used in this work, would fall under a non-oily class.

Acknowledgements.—The author is grateful to the Director of Scientific and Industrial Research, Karachi for giving facilities for work in the Central Laboratories, and to the Director, Central Fisheries Department, Government of Pakistan, for his kind permission and helping him in identifying the fishes used in this experiment, and also to Agha Ghulam Hussain, Deputy Director, Central Fisheries Department, for his keen interest and contained encouragement thoughout these investigations.

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