

cells was observed by the writer. In the absence of any mature telium it would be best to retain the rust under *Uredo*. The urediospores of *Schroeteriaster Elettariæ* are orange-yellow, measuring $20-34 \times 15-20 \mu$ as against the hyaline spores of the rust under study which measure $26-32.5 \times 19-27.4 \mu$. The rust can be accommodated only as a new species and the name *Uredo Elettariæ* Thirumalachar is proposed.

Uredo Elettariæ THIRUMALACHAR SP. NOV.

Uredia amphigena, subepidermalia, erumpentia, albida et aparaphysta; urediosporæ ovata-ellipsoidæ, echinulatae, poris germ. indistinctis, magnitudinis $26-32.5 \times 19-27.4 \mu$. Hab. on vivis foliis *Elettaria cardamomum* Maton, leg. M. J. Thirumalachar, 14-4-1940, Balehonnur, Mysore State, type deposited in the Herb. Crypt. Ind. Orient, New Delhi.

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July 6, 1943.

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1. Mains, E. B., "The status of the genus *Schroeteriaster*, *Ann. Mycol. Berl.*, 1934, **32**, 256-59. 2. Mayne Wilson, W., Report on Cardamom cultivation in South India, *Misc. Bull. No. 50. Imp. Council. Agri. Res., India*, 1942, pp. 1-67. 3. Raciborski, M., *Parasitische Algen und Pilzen Javas*, 1900, **2**, 28-29.

PYRETHRIN CONTENT OF INDIAN PYRETHRUM

DURING the past few years much interest has been taken in the cultivation of pyrethrum

(*Chrysanthemum cinerariæfolium* Boic.) in India and with the help of the Imperial Council of Agricultural Research experimental cultivations have been started at a number of stations. As reported by Burns,¹ pyrethrum has failed to establish itself at Dharwar, Poona, Saharanpur, Dehra Dun, Chaubattia (Ranikhet U.P.), Sakrand (Sind), and Ranchi, but the attempts have succeeded at Murree, Kulu, Palampur, Kashmir and since the time of the above report, also at Shillong, Mayurbhanj, Kodaikanal, Coonoor and Mysore.

It is well known that success in the cultivation of pyrethrum depends upon the type of soil, altitude of the locality, climate, distribution of rainfall, cultural and manurial treatment, conditions of flowers at harvesting, etc. Full data are not yet available for all the stations where pyrethrum has been a success and in their absence it is not possible to discuss the reasons why the pyrethrum grown at Kodaikanal is superior to that grown in Murree but it may be stated that the Indian experiments appear to prove what has been established elsewhere, namely, that pyrethrum grows best in localities with 40-80 inches of rainfall, well distributed throughout the year. Pyrethrum failed to flourish in Dehra Dun because of nearly 60 inches of rainfall during the three rainy months, which damped off the plants.

In the following table the pyrethrin content of pyrethrum flowers (open), obtained from different localities, is recorded and for comparison the figures for Kenya, Japanese and Dalmatian flowers are also given. All the figures given in the table are comparable, as they have been obtained by the same method

Locality	Altitude	Annual rainfall	Normal rainfall in July, August and September	Pyrethrin I	Pyrethrin II	Total Pyrethrins
<i>Kashmir</i>	ft.	in.	in.	%	%	%
Tangmarg	7,200	15 + winter snow	11	0.35	0.57	0.92
Baramulla	5,200	38	6	0.32	0.62	0.94
<i>Punjab</i>						
Palampur	4,500	101	72	0.22	0.68	0.90
Murree	7,113	57	31	0.37	0.66	1.03
Kulu	4,500	39	15	0.35	0.40	0.75
<i>N.W.F. Province</i>						
Tarrab	2,000	17	6	0.31	0.59	0.90
<i>United Provinces</i>						
Dehra Dun	2,239	87	59	0.63	0.15	0.78
<i>Garkwal</i>						
(Pandar range)	4,000	70	44	0.29	0.28	0.57
<i>Madras</i>						
Kodaikanal	7,688	62	19	0.76	0.62	1.38
Coonoor	5,730	64	10	0.44	0.45	0.89
<i>Assam</i>						
Shillong ⁴	4,921	84	40	—	—	1.41
<i>Orissa</i>						
Mayurbhanj ⁶	1,600	60	32	—	—	1.15
<i>Mysore</i>						
Bangalore ⁵	3,021	35	16	—	—	0.80
Kenya	7-9,500	40-65	—	0.77	0.56	1.33
Japan	—	40-80	—	0.38	0.63	1.01
Dalmatia	—	40	—	0.35	0.63	0.98

of assay, namely, a combination of Seil² and Pantsios.³

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June 6, 1943.

1. Burns, *Indian Farming*, 1941, 2, 58. 2. Seil, *Chem. Trade J.*, 1934, 85, 168. 3. Pantsios, *Ind. and Eng. Chem., Anal. Ed.*, 1935, 10, 386. 4. Chakrabarti, *Indian Farming*, 1942, 3, 12, 652. 5. Anon, *Ibid.*, 1942, 3, 8, 441. 6. Lahiri, Ghose and Chopra, *J. Amer. Pharm. Assoc.*, 1941, 30, 72.

THE KURRAM SANTONICA

THE *Kurram santonica* has been commercially exploited for manufacturing santonin since 1927. On account of its great economic value its cultivation has been considerably extended in the valley resulting in a remarkable increase in the annual yield. Repeated attempts were made in the past to introduce the *Kurram santonin* into the adjoining territories of the Khyber, Waziristan, Malakand agency, Chitral and Kaghan, but so far these have not been successful. The failure is chiefly due to defective methods of cultivation.

Krishna and Varma¹ attempted to grow *artemisia* at Dehra Dun, and they reported that the plant raised from seeds obtained from the santonin containing *Kurram Artemisia* "produces flower-heads twice a year and consequently has two periods of maximum santonin content, namely, June and December".

It may be pointed out that the climatic conditions during the months of June and December are entirely different. The appearance of two regular crops of flower-heads and leaves on the same branches of the same plants during two extremely different climatic conditions is most extraordinary. With regard to *Artemisia* growing under natural or proper cultural conditions such a phenomenon is least expected. There is no evidence available from any other quarter in support of it. Two periods of maximum santonin content at two different flowering periods during one year is not only out of harmony with their previous finding but is also not a natural phenomenon as far as *Artemisia* is concerned.

In the case of the *Kurram santonica*³ there are two maxima from the point of view of santonin content. One when the new leaves are fully developed in late spring and the second when the immature unopened flower-heads are well developed.

Artemisia has been under cultivation in the botanic garden of the Islamia College for the last ten years. The plants were raised from seeds brought from the *Kurram* valley and the Khyber. Transplants were also brought. All the plants are doing very well. I have been carefully watching the appearance of flower-heads of the santonin-containing as well as the santonin-free forms of *Artemisia*. I have been several times to the *Kurram* valley, Khyber, Waziristan, Kaghan valley, Baluchistan and

some parts of Afghanistan, where *Artemisia* grows wild in great abundance. I² have "in no case observed the normal appearance of two (regular) crops of flower-heads in a year" on the same plants. It has, however, been observed in the case of santonin-free and some hybrid forms, that the flowering is late as compared with the genuine santonin-containing form and the flowering period is very much prolonged with the result that in some cases the plants bear fresh flower-heads side by side with old withered flower-heads. In the case of the genuine santonin-containing form the flowering period is earlier and comparatively much shorter."

Moreover, in the case of some cultivated plants it was observed last year that if the vegetative shoots are cut off just before the appearance of the flower-heads, the flowering period is much delayed. Further work in this connection is in progress.

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June 14, 1943.

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1. Krishna and Varma, *Quart. J. Pharm. Pharmacol.*, 1933, 6, 23. 2. Qazilbash, *Ibid.*, 1942, 15, 323.
3. Coutts, *Ibid.*, 1934, 7, 404.

THE cultivation of *Artemisia* in Dehra Dun was attempted on the strength that the plant being Zerophytic would perhaps flourish even in a wet locality. Our experiments have shown that given proper care, *Artemisia* can be grown but that Dehra Dun is not a fit place at all. Therefore these experiments have long been dropped and the observations made earlier have never had the opportunity of being checked.

The plants that showed two flowering periods were remnants that had survived three monsoons. In Dehra Dun *Artemisia* starts growing in April and the flowerheads appear in June. These flowerheads drop off in July when the monsoon has settled and the plant shows, in general, a sickly appearance but starts giving new shoots and flowerheads as soon as the monsoon is over.

This records our observations but it is difficult to offer an explanation especially when the plant has been grown in a climate so different from that of its natural habitat. It is possible that if the monsoon were not so heavy (about 70 inches in July, August and September) the flowerheads formed in June would have opened in due course without being killed and a second flowerhead would not have been formed after the rains. Mr. Qazilbash cites the case of delayed flowering in hybrid forms of *Artemisia* which is interesting reading in this connection.

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