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ALKALOIDS OF SARCOCOCCA SALIGNA MUEL: SALIGNINE

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Kiamuddin and Haque[1] have reported the isolation of two new alkaloids, named and formulated as salignine, $C_{29}H_{52}N_2O$, m.p. 229–230°C and base II, $C_{25}H_{44}NO$, m.p. 136–137°C from the dried leaves of *Sarcococca saligna* Muel (*Syn. S. pruniformis*). Kohli *et al.*[2] and Chatterjee and Mukherjee[3] had already isolated seven alkaloids (Table 1) from *S. pruniformis*.

Salignine was reported to contain[1] two *N*-methyl and three *C*-methyl groups. The presence of a double bond, a monosubstituted benzene ring and an isopyropyl group was inferred[1] from IR spectrum of salignine. Since these structural features were not present in any of the known alkaloids (Chart 1) of *S. pruniformis*, it was considered worthwhile to investigate the structure of salignine. Evidence presented in this paper indicates that salignine is identical with saracodine (I).

A purified sample of salignine, m.p. 235–236°C showed mass spectral peaks at m/e 402 (molecular ion peak, M^+), 387 (M^+-15), 302, 110, 100, 84, 58, 43 (acetyl, $COCH_3$) and 42. The molecular ion peak at m/e 402 corresponds to $C_{26}H_{46}N_2O$ for salignine. On the basis of fragmentation pattern[3,4] alone, salignine can be identified as saracodine (I). [Chart 2 and Fig. 1].

The NMR spectrum of salignine which showed peaks at 9.2 (doublet, $j=5.0$ c/s, 3H, a secondary *C*-methyl group), 8.85 (singlet, 3H, a tertiary *C*-methyl group), 7.9 (doublet, 3H, CH_3 CON, internal hindered rotation)[5], 7.78 (singlet, 6H, two *N*-methyl groups) and 7.2τ (doublet, 3H CH_3NCO, internal hindered rotation),[5] is also in agreement with the saracodine structure. Compatible with the amide structure of salignine, its IR spectrum showed a very strong band at 1635 cm^{-1}.

That salignine is not identical with saracosine (II), as the close melting points of the two would suggest, is indicated by the following observations: IR spectrum of salignine does not show any absorption band due to carbon–carbon double bond; the mass spectrum of salignine showed one of the strongest peaks at m/e 110, whereas it had been observed by Chatterjee *et al.*[3] that the mass spectrum of saracosine does not show any peak at m/e 110.

In view of the above spectral evidence, it is suggested that salignine is identical with saracodine (I).

Work is in progress on the isolation and characterization of other alkaloids from *Sarcococca saligna* Muel.

TABLE 1.—ALKALOID OF *S. pruniformis*.

Name	Formula	m.p. °C	$[\alpha]_D$	Ref.
Saracodine (I)	C26H46N2O	190–2 245–6		2,3
Saracosine (II)	C26H44N2O	235–6		2,3
Saracodinine)III)	C23H38N2	136		3
Alkaloid A (IV)	C28H48N2O	148–50	+46	3
Alkaloid B (V)	C28H47NO2	274–6	+10	3
Alkaloid C		144		3
Alkaloid D		151–3		3

Experimental

The IR spectrum was taken in nujol on Beckman IR-5 spectrophotometer. NMR spectrum, with tetramethylsilane as external standard, was taken in $CDCl_3$ solution on Varian Associates A-60

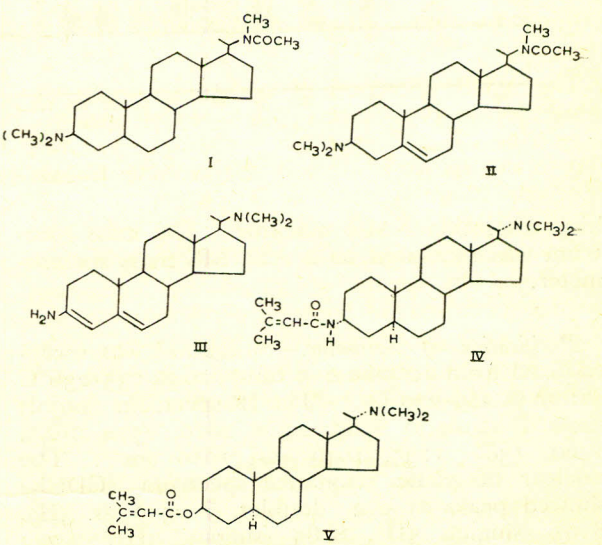

Chart 1.—Structure of alkaloids from *S. pruniformis*.

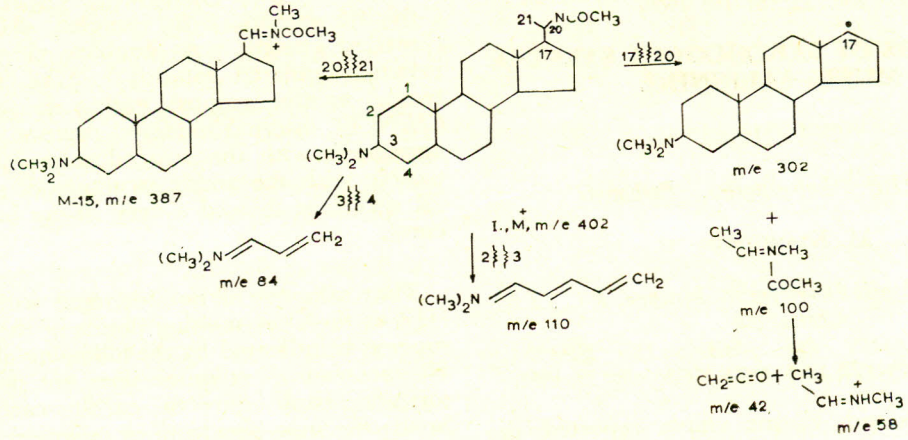

Chart 2.—Mass spectral fragmentation pattern of salignine,

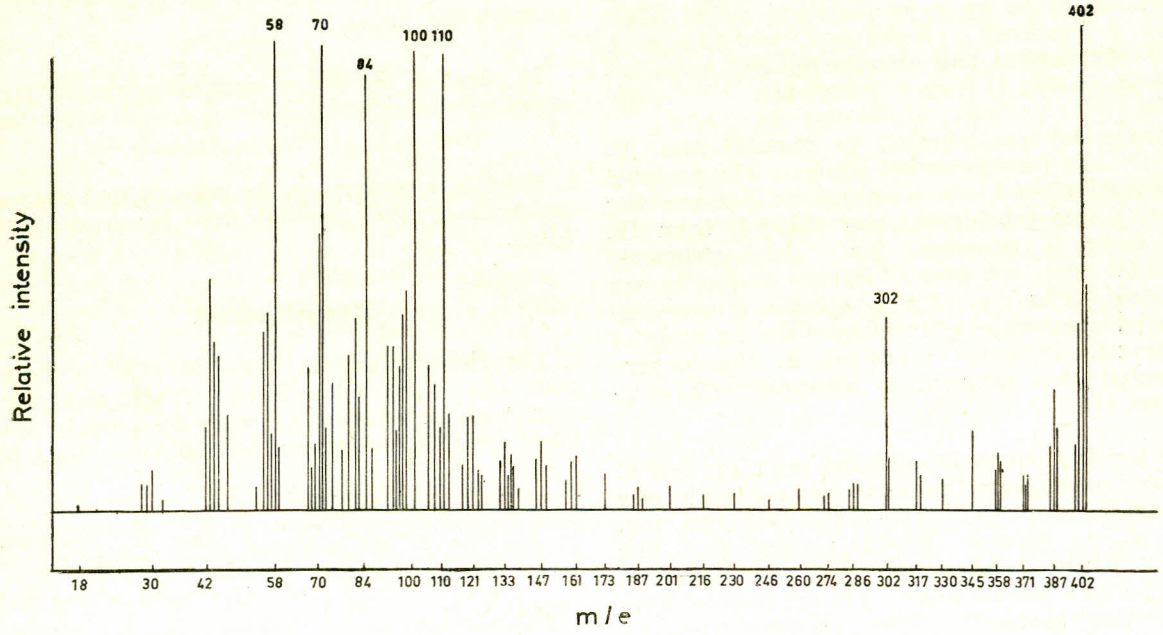

Fig. 1.—Mass spectrum of salignine.

high resolution NMR machine. The mass spectrum was measured on a AEI MS mass spectrometer.

Purification of Salignine.—Salignine[1] was recrystallized from acetone 2–3 times, m.p. 235–236°C (lit. m.p. 229–230°C).[1] The IR spectrum (nujol) showed bands at 2960, 2920, 2810, 2770, 1635, 1460, 1380, 1135, 1040 and 1010 cm^{-1}. The nuclear magnetic resonance spectrum ($CDCl_3$) showed peaks at 9.2 (doublet, J=5.0 c/s. 3H), 8.95 (singlet, 3H), 8.85 (singlet, 3H), 7.9 (doublet, 3H), 7.78 (singlet, 6H) and 7.2τ (doublet, 3H). Mass spectral peaks at m/e 402, 387, 302, 110, 100, 84, 70, 58, 43, 42 and 18.

Acknowledgement.—The authors wish to thank Dr. S.A. Warsi, Director, P.C.S.I.R., Laboratories, Peshawar for his keen interest in this work. Thanks are also due to Dr. P. Bravo, Istituto Di Chimica, Politechnico Di Milano, Milano, Italy for UV, IR, NMR and mass spectra.

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MINERALOGY OF ASBESTOS FROM KURRAM AGENCY

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Earlier Qaiser, Ali and Khan[1] have reported the mineralogy of asbestos found in Charsadda area, Khyber and Mohmand Agencies. The present paper deals with the mineralogy of asbestos found at Darra Loi Tanga, a place 7 miles from Ziran towards Kohi-Sufed. The asbestos occurs with serpentine. The sample was brought to the Laboratories by Mr. Noor Mohammad of Peshawar, a mineral diviner.

The asbestos is of cream colour, silky in lustre and soft. The fibres are strong and flexible. The asbestos was found to be comparable with the Canadian chrysotile.

The experimental procedure adopted for the study of this mineral is the same as described by Qaiser *et al*[1].

Oxide composition of the Mineral

The chemical composition of the mineral is:

SiO_2, 37.55; Al_2O_3, 2.81; Fe_2O_3, 2.65; MnO, 0.00; MgO, 38.61; CaO, 0.97; Na_2O, 0.30; K_2O, 0.09; TiO_2, 0.00; P_2O_5, 0.01; loss on ignition, 17.34%; Total, 100.33.

The relationship of the ions in octahedral and tetrahedral coordination as calculated from the chemical analysis of the specimen is given as follows:

The structural formula for the sample may be written as:

$(Mg_{5.64}\ Fe_{0.19}\ Ca_{0.10}\ Na_{0.06}\ K_{0.01})$
$(Si_{3.46}\ Al_{0.32})\ O_{10}\ (OH)_8$

X-Ray Diffraction Studies

The X-ray diffraction data of the fibre pattern, together with the Canadian chrysotile is given in Table 1. Fibre pattern of the Kurram asbestos tails out toward the edges of the diagram and is not very sharp. The presence of a strong reflection at d=2.98A seems to be unusual, the line remains unidentified.

TABLE 1.—X-RAY DIFFRACTION DATA (FIBRE PATTERN).

A1		A2		Chrysotile[2]	
d(A)	I	d(A)	I	d(A)	I
7.37	v.s.	7.37	v.s.	7.36	10
4.59	s.	4.59	s.	4.58	6
3.68	v.s.	3.68	v.s.	3.66	10
2.98	s.	—	—	—	—
2.48	s.	2.48	s.	2.45	8

A1—Sample under investigation. A2—Canadian chrysotile.

Differential Thermal Analysis

The DTA curve of the Kurram Asbestos shows an endothermic peak between 600° and 730°C with a peak temperature of 685°C, and a very sharp exothermic peak between 810° and 835°C with a peak temperature of 825°C. Then DTA curve of Kurram asbestos is comparable with those of the Canadian and Tangi chrysotile[1].

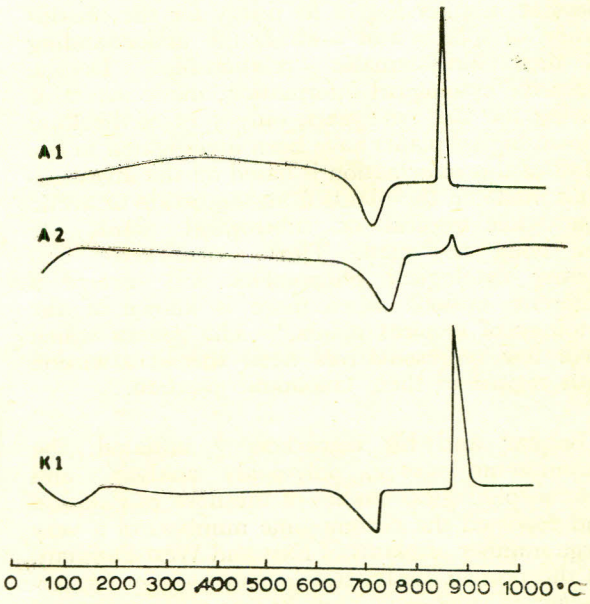

Fig. 1.—DTA curves of A1, A2 and K1.

Conclusions

The chemical composition, X-ray diffraction data and DTA show that the Kurram asbestos is a chrysotile one. Good tensile strength allows the asbestos to be used for industrial purposes. A detailed geological survey of the area is recommended.

Acknowledgement.—The authors are thankful to Dr. S.A. Warsi, Director, P.C.S.I.R. Laboratories, Peshawar, for encouragement throughout the work.

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TWO NEW GENERIC CHROMOSOME RECORDS

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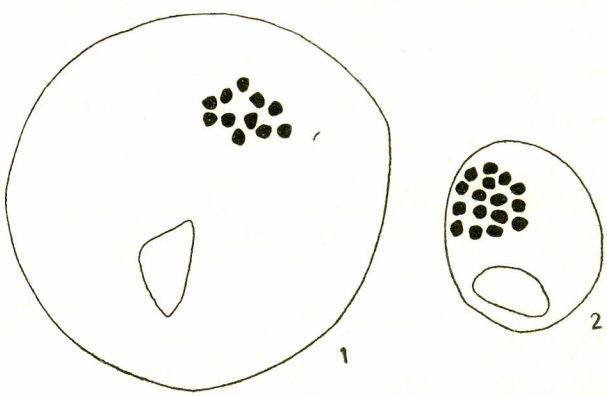
The significance of the knowledge of the chromosome number lies in its utility for the classification of species and towards the understanding of their biosystematic relationship. Despite extensive cytological information, made available during the last 50 years, only 1/10 of the total known higher plants have been investigated so far. Most of this information is based on the investigations made on the plants from temperate or arctic zone while tropical or subtropical plants are yet lying neglected. Tjio[9] remarked that "many cytological phenomena will receive a different outlook when more is known of the cytology of tropical plants." The genera which have few representatives need special attention with regard to their taxonomic position.

Baquar and his coworkers[1–9] initiated, the chromosome survey, polyploidy analysis and cytomorphological studies of the flora of Pakistan and reported the chromosome numbers of a very large number of plants of East and West Pakistan. In the present study, two genera namely *Physorrhynchus* (Cruciferae) and *Rhazya* (Apocynaceae) have been investigated and their chromosome numbers and cytological behaviour reported for the first time. Both these genera are comprised of only 2 species each and are restricted to dry arid region of West Pakistan, Afghanistan and Arabia. Their restricted distribution on the globe, in a region wherefrom very little is known about the cytology of plants, is probably the reason why they were not investigated as yet. Buds were fixed, from the plants growing in their natural environment, in Carnoy solution and chromosome counts were made in the pollen mother cells using the usual acetocarmine technique. *Physorrhynchus brahuicus* Hook. f. was collected from the foot of the hills in North Nazimabad (Karachi) while *Rhaza stricta* Decne. was collected from Ghaggar Naddi near Gharo (42 miles from Karachi). The voucher specimens have been deposited in the Herbarium of the PCSIR Laboratories, Karachi (CLH).

Physorrhynchus brahuicus Hook. f $n=16$.—It is tall perennial shrub, woody at the base having lower ovate-oblong, $3–6\times2–4$ cm, shortly stalked leaves and upper small, sessile leaves which are auricled at the base. Flowers violet or purple, 15–20 mm across; fruit subglobose, beaked, $10–20\times4–6$ mm, smooth, 1–2 seeded. Meiosis was found to be quite normal throughout from prophase to pollen formation and clear 16 bivalents (Fig. 2) were counted at diakinesis, metaphase I and equal number of chromosomes at metaphase II. Pollen fertility ranged between 90–95% from plant to plant.

Rhazya stricta Decne. $n=11$.—A small glabrous undershrub, reaching a height of about 1 meter, having alternate, sessile, leathery, elliptic-lanceolate acute leaves, $7–10\times$ 1–2 cm; flowers pedicilled white, 1 cm across; fruit a subcylindric erect follicle, $5–7\times.6$ cm; seeds angularly compressed, shortly winged, 8 mm long. This species also displayed a perfectly



Figs. 1 and 2.

normal meiotic division throughout and 11 bivalents (Fig. 1) were counted in many plates at diakinesis and metaphase I. Pollen fertility was as high as 95%.

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THE INHIBITION IN RESPIRATORY RATE OF BANANAS BY ETHYLENE

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The respiratory activity of living tissues in many instances is accelerated by the application of ethylene.[1] During the climacteric rise, however, the presence of ethylene did not alter the respiratory behaviour of fruits.[1,3] The inhibitory effect of ethylene on the respiration of plant tissues has not been reported. Such an effect of ethylene was observed with bananas.

Hard green bananas weighing 2.0 to 2.25 kg were kept in sealed desiccators connected to cylinders having the desired composition of gas. The gas mixtures were prepared by introducing measured amounts of ethylene, oxygen and carbon dioxide into cylinders previously evacuated by a vacuum pump. Final analysis of the gas by an Orsat Analyser showed that the gas mixtures consisted of 0.5% and 1.0% oxygen with and without 100 ppm of ethylene.

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Air from each desiccator was removed at the beginning of the experiment with a vacuum pump and a mercury manometer was attached to test for the leaks. The gas mixtures from the cylinders were then flushed at a constant rate of 0.3 ft^3 per hr. Outflowing gas from the desiccator was taken in a 25-ml syringe and introduced in a gas chromatograph. The amount of carbon dioxide was determined using a thermal conductivity detector and an 8-in, 30–60 mesh silica gel column. The rate of respiration was determined on the basis of CO_2 produced per hr per kg weight of fruit. The experiments were carried out in a constant temperature growth chamber maintained at 68°F. The results were verified thrice.

Fig. 1 shows that the sample exposed to 0.5% oxygen exhibited a rate of respiration greater han that exposed to 0.5% oxygen with ethylene. This unusual behaviour was observed during the initial 22 hr of the experiment. The sample subjected to 1.0% oxygen and ethylene on the contrary exhibited a greater respiratory activity than the sample exposed to 1.0% oxygen without ethylene.

It is evident that the presence of ethylene with 0.5% oxygen retarded the rate of respiration during the initial 22 hr of the experiment. Previous studies[4] showed that the critical oxygen level for the respiration of bananas existed during the initial 24 hr of the experiment and was close to 2.5% oxygen. Oxygen levels below 2.5% therefore constituted the sub-threshold values and would thus induce an anaerobic type of respiration. It could be argued that at the 1.0% oxygen level a few of the cells maintained their aerobic activity and this activity was accelerated by the presence of ethylene. At the 0.5% oxygen level all the cells passed from the aerobic to anaerobic phase whereby the presence of ethylene did not accelerate their respiratory rate.

Burg[2] explained the mechanism of ethylene action assuming that ethylene alongwith oxygen must bind itself to a metallic receptor present in the cell. The formation of labile product depended on the saturation of receptor sites with oxygen and ethylene. Present studies suggested that if the receptor site is not saturated with oxygen, the presence of ethylene alone may cause an inhibitory effect on the rate of respiration. There is some suggestion that gas exchange rates through the peel may also be involved.

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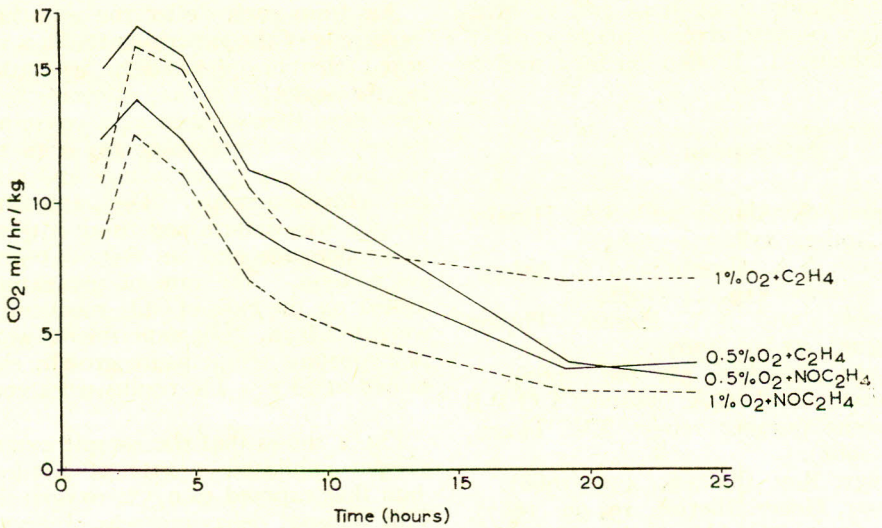

Fig. 1.—Effect of low oxygen concentration and ethylene on the rate of respiration in bananas.

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REPORT ON THE OCCURRENCE OF BLAST OF RICE IN SOUTH WEST PAKISTAN

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Half of the world's population depends on rice as its principal food, but the rice yields are seriously inadequate. Blast of rice caused by the fungus *Piricularia oryzae* Cavara is one of the most destructive diseases reducing rice production and the magnitude of the damage caused by this disease could well be judged from the fact that International Cooperation has now been sought under the FAO of the United Nations for collective efforts to reduce the losses suffered from this disease.

Blast of rice is world-wide in distribution and is known to occur in over 60 countries.[1] In India it was first reported by Butler in 1913 and is now a serious problem throughout that country. In West Pakistan, it was first reported by Sultan Ahmad[2] but there is no published record, as far as known to the authors, of the occurrence of this pathogen in this part of West Pakistan.

In June 1967, the first proof of the occurrence of this malady was observed in Sujawal area (District Thatta) where two rice varieties locally known as Kangni and Ganga were found showing typical leaf symptoms—detailed morphology of the causal fungus and the symptoms observed, are given at the end of the text of this note.

In West Pakistan efforts are being made to boost rice production. Serious outbreaks of blast generally occur under conditions of intensive cultivation and high levels of nitrogenous fertilization. Since blast has now been recorded in this region, it is all the more necessary to examine the factors which are favourable for the spread of this disease and investigations to keep the disease under check should be initiated so that the national rice production programme does not suffer any set-back on account of this disease.

Symptoms and the Morphology of the Causal Fungus

Infection spots on the leaf-blade roundish to broadly spindle shaped, with pale ashy centres and brownish red margins, usually 1–3 mm in dia, gradually enlarging and may be 2 cm long and 2 to 4 mm broad; stromata lacking or indistinct; fruiting amphigenous, conidiophores selender, emerging through stomata singly or in bundles of 2–4 stalks, yellowish brown in colour, 1 to 3 times geniculate, 3–12 septate, not constricted at the septa, base of some of the conidiophores

swollen, rarely branched, 30–144×4–5.2μ, spore scar medium, visible under high power.

Conidia sub-hyaline to slightly yellowish brown, pyriform to obclavate, tapering at the apex, 1–3 septate, usually 1–2 septate, not constricted at the septa, 12–24×6.5–9.2μ, base extended into a short tooth (basal appendage) 0.9 to 1.2μ, hyaline.

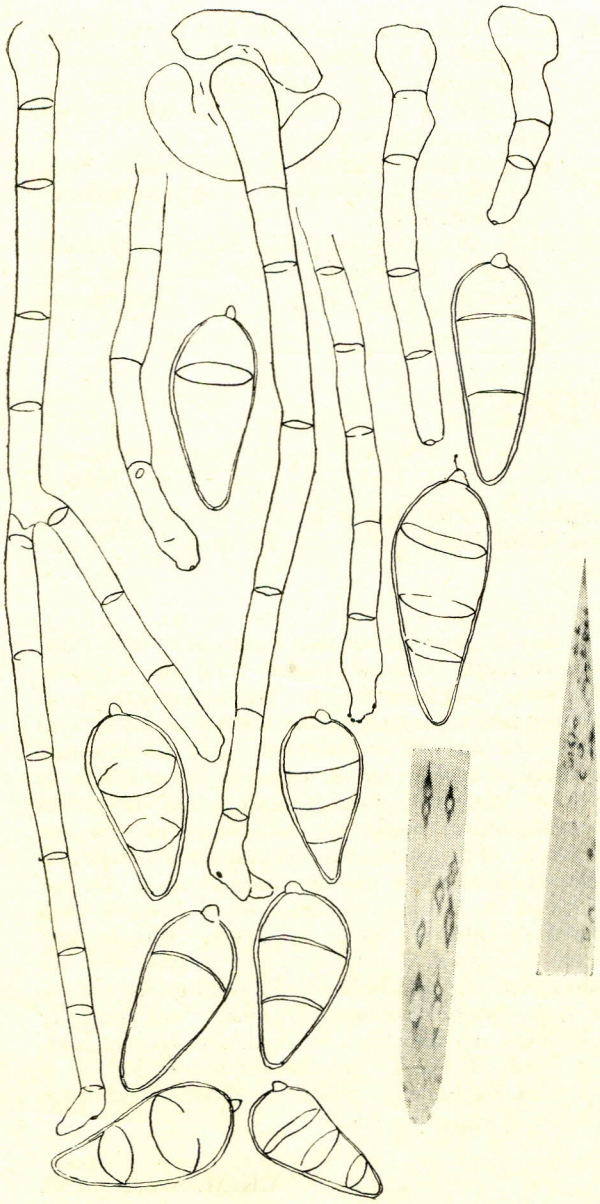

Fig. 1.—Pericularia oryzae cavara. Comidia and conidiophores×750.

On living leaves of *Oryza sativa* L., Sujawal (District Thatta), West Pakistan, 26-6-1967, S.A. Khan and Hashmat Ali, C.M.I. Kew No. I.M.I. 128776.

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THE SUB-SPECIES OF POLYDORUS ARISTOLOCHIAE (FABR), PAPILIONIDAE

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(Received November 26, 1968; revised January 10, 1969)

Polydrus aristolochiae (Fabr) is one of the commonest large-tailed butterflies of the Indo-Pakistan subcontinent. The work on the relative population of two sub-species and their sex ratio was taken up at Tandojam in 1963 and continued upto 1967.

Munshi recorded the sex ratio of *P. aristolochiae*. Two sub-species have been recorded as *P. aristolochiae aristolochiae* and *P. aristolochiae diphilus* by Talbot[2] and Wynther-Blyth.[3] The relative abundance and sex ratio of the two sub-species have not been reported by any worker.

Results

Total number of specimens of *P. aristolochiae* collected were 648. These were examined in the laboratory at the Agriculture College, Tandojam. The relative population of the two sub-species recorded and their sex ratio is presented in Tables 1–3.

Discussion and Conclusion

Talbot[2] and Wynter-Blyth[3] have reported the existence of two sub-species, but none of the earlier

TABL 1.—RELATIVE ABUNDANCE OF THE SUB-SPECIES.

Total No. of adults examined	Sub-species		Ratio
	P. a. aristolochiae	*P. a. diphilus*	
648	384	264	16:11 or 1.5:1

TABLE 2.—SEX RATIO OF *Polydorus aristolochiae aristolochiae*.

Total No. of adults examined	Male	Female	Ratio
384	191	193	1:1

TABLE 3.—SEX RATIO OF POLYDORUS *aristolochiae diphilus*.

Total No. of adults examined	Male	Female	Ratio
264	166	98	2:1.2

workers has mentioned their relative abundance or sex ratio. The relative abundance of the two sub-species *P. aristolochiae aristolochiae* and *P. aristolochiae diphilus* found at Tandojam was in the ratio of 1.5:1, and their sex ratio was found to be 1:1 and 2:1.2 respectively.

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BOOK NOTICES

Book Reviews

Electromagnetic Theory, V.C.A. Ferraro. The Athlone Press and the English Language Book Society, University of London. Price 14s.

This book is a systematic account of basic theory of electromagnetism. The standard of the test is quite advanced and intended for students who are familiar with vector analysis. The first chapter is rightly devoted to the fundamentals of vector analysis. The main material is presented in chapters 2-20 and dealt essentially with electrostatics, magnetostatics, steady electric current, boundary value problems and electrodynamics. The treatment of each problem is mathematically oriented and more or less lucid. Of particular interest are the theoretical sections which are illustrated by a number of worked out examples followed by a good number of exercises at the end of each chapter which will motivate the student into learning the material more clearly.

Electromagnetism is an exciting subject which has an important bearing in the field of technology. Electromagnetic theory essentially deals with the question of modification of electric field caused by dielectric material near to (not at) the point in question. This aspect is shortly discussed in chapter 7. This should have been elaborated in some more detail to motivate the student to further study.

It may be pointed out that some of the important and certainly related topics such as legendre functions, ferromagnetism electrodynamics of moving media and electron theory of dispersion have been omitted in he text. The book would be more complete by introducing these topics in relevant chapters, for example, the theory of ferromagnetism could be introduced in chapter 10 along with para and diamagnetism, whereas electrodynamics of moving media could be introduced by adding an extra short chapter with boundary value problems in part 2. But, by and large, the book is well written to meet the requirements of a text book of electromagnetic theory for B.Sc. honours course of physics and specially of applied mathematics in Pakistani Universities. The book, I think, can be recommended as a text book for honours graduate students and I am sure it will appeal to them.

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