routine estimation of microbial population in the interstitial water at Porto Novo open beach the authors observed that some bacterial colonies showed antibacterial and antifungal properties. Such colonies were isolated, purified and tested for their antibiotic property under laboratory conditions.

Different staining and biochemical tests showed that they belong to *Bacillus* sp. The antibiotic was isolated by the modified method of Chandramohan and Mahadevan.[4] The culture was grown in liquid nutrient broth for three days with eight-hour shaking per day at room temperature ($26 \pm 2°$ C.) The broth was filtered through Millipore filter using Whatman No. 42 filter-paper and the cell-free culture filtrate (pH 5·4) was adjusted to pH 4·0 with 1 N HCl and extracted three times with ether (Fraction 1). The same filtrate was again adjusted to pH 10·0 with 1 N NaOH and similarly extracted with ether (Fraction 2). The bacterial cells were washed several times with sterile glass-distilled water and ground in a glass mortar with acid-washed quartz and extracted with ether (Fraction 3). The ether fractions were evaporated separately under reduced pressure and each residue was dissolved in 2 ml. of ethanol. 150 $\mu$l. of the extract were spotted on standard antibiotic disc (S 740 E) and assayed against test cultures.

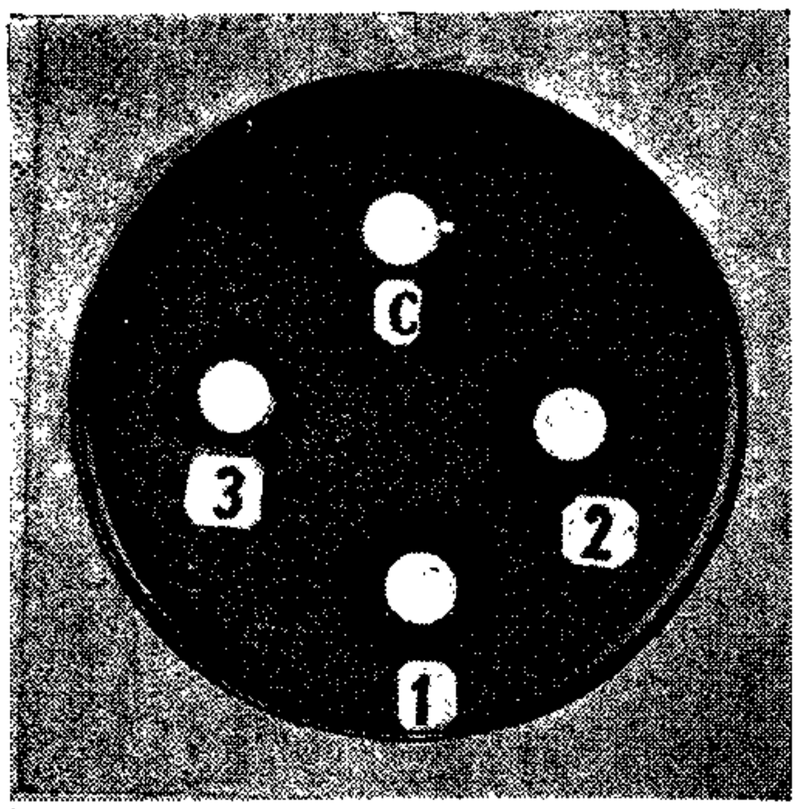


FIG. 1. Inhibition area caused by various fractions.

The antibiotic showed good inhibition of another *Bacillus* sp. isolated in the same area. Even though all the fractions had antibacterial property, fraction 1 showed highest inhibition followed by fractions 2 and 3. The area of inhibition is expressed according to scheme of Smale and Keil[5] and shown in Fig. 1 and Table I. In addition to this the fractions were tested against *Xanthomonas* sp. (gram negative),

TABLE I

*Antibiotic activity against* Bacillus *sp.*

| Sample | Quantity of culture filtrate used (ml.) | Dry weight of bacterial cells (mg.) | Area of inhibition ($mm.^2$) |
|---|---|---|---|
| Fraction 1 .. | 100·00 | .. | 459·64 |
| " 2 .. | 100·00 | .. | 201·14 |
| " 3 .. | .. | 56·20 | 170·50 |

*Saccharomyces* sp. (yeast) and *Aspergillus* sp. (fungus). The various fractions were not active against gram negative and yeast but inhibited markedly the fungus. It is evident that the antibiotic reported here has both antibacterial and antifungal properties. In spite of earlier reports[6] about few antibiotics from *Bacillus* sp., this seems quite interesting under marine environments.

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Centre of Advanced Study in Marine Biology, Marine Biological Station, Porto Novo, S. India, *March* 14, 1970.

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## PEAT-BASED LEGUME INOCULANT EXPERIMENTS WITH SOYBEAN

PEAT AND SOIL are used widely as carriers for *Rhizobium* spp. In this country soil based cultures fortified with sucrose (1%), $K_2HPO_4$ (0·05%) and lime (3%) have been in vogue and only recently in this laboratory, peat obtained from Ootacamund (Nilgiris) has been found to be an efficient carrier for *Rhizobium*.[3] The survival of the applied rhizobia in this material is quite high as compared to soil because of its high organic matter content, better aeration and greater water-holding capacity which are all helpful for the purpose.[1,2,4]

Cultures of *Rhizobium japonicum* are very sensitive to high temperatures. In our country where the soil temperature may reach values higher than 35° C, it is obviously an important factor for the survival of rhizobia present in soil and added inoculum with soil and seed.

During the present study the peat culture for soybean prepared in this laboratory was compared with the imported cultures during *Kharif* 1969 at the following centres:

Delhi, Pantnagar, Jabalpur, Kalyani, Amravati, Junagarh and Katrain using the varieties Bragg and Lee. The nodulation status and yield of soybean are given in Tables I and II.

been appreciably improved by the I.A.R.I., and imported peat-based cultures in all other centres. From Table II it is clear that the peat cultures prepared in this laboratory had proved to be at par with the imported peat cultures in the case of Pantnagar, Jabalpur, Amravati and significantly superior in the case of Kalyani, Junagarh and Katrain in their performance.

In previous years soil cultures were being used and since the sowing of soybean was done in the month of June or July, the temperature was quite high and survival on the seed of the order of $10^3$–$10^5$/seed might not have reached at the time of sowing since soybean *Rhizobium* was sensitive to high temperatures.

TABLE I

*Field experiment* (Kharif *1969*)—*Nodulation status*

| Treatments | Var. Bragg | | | | | | | Var. Lee |
|---|---|---|---|---|---|---|---|---|
| | Delhi (Alluvial soil) | Pantnagar (Foot hill swampy soil) | | Jabalpur (Shallow black soil) | Kalyani (New alluvial soil) | Amravati (Medium black soil) | Junagarh (Medium black soil) | Katrain (Sub-montane) regional soil |
| | | Expt. I* | Expt. II | | | | | |
| No culture .. | 16 | 40 | 4 | 7 | 29 | 12 | 2 | 20 |
| *Imported peat cultures:* | | | | | | | | |
| Nitragin .. | 18 | 56 | 36 | 25 | .. | 58 | 18 | .. |
| Legumeaid .. | .. | .. | .. | 16 | 313 | .. | .. | 30 |
| *IARI peat cultures:* | | | | | | | | |
| SB- 1 .. | 14 | .. | .. | 26 | 419 | 59 | 23 | 76 |
| SB- 5 .. | 12 | .. | .. | .. | 319 | 73 | 43 | 132 |
| SB- 7 .. | 10 | .. | 68 | .. | 966 | 38 | 33 | 61 |
| SB-16 .. | 17 | 56 | .. | 34 | 634 | 79 | 24 | 98 |

* Expt. I was a demonstration trial.

TABLE II

*Field experiment* (Kharif 1969)—*Yield of soybean*

| Treatments | Var. Bragg-Yield in quintals per hectare | | | | | | Var. Bragg | Var. Lee |
|---|---|---|---|---|---|---|---|---|
| | Delhi | Pantnagar | | Jabalpur | Kalyani | Amravati | Junagarh yield—beans kg./plot | Katrain yield—beans quin./hectare |
| | | Expt. I* | Expt. II | | | | | |
| No culture .. | 19·21 | 24·25 | 29·22 | 18·03 | 24·26 | 7·25 | 0·266 | 33·33 |
| *Imported peat cultures:* | | | | | | | | |
| Nitragin .. | 19·15 | 47·25 | 43·92 | 36·23 | .. | 11·91 | 0·422 | .. |
| Legumeaid .. | .. | .. | .. | 30·30 | 30·92 | .. | .. | 44·85 |
| *IARI peat cultures:* | | | | | | | | |
| SB- 1 .. | 19·33 | .. | .. | 34·15 | 37·23 | 10·28 | 0·556 | 44·14 |
| SB- 5 .. | 18·16 | .. | .. | .. | 32·69 | 14·08 | 0·550 | 34·16 |
| SB- 7 .. | 17·79 | .. | 42·41 | .. | 34·73 | 10·71 | 0·395 | 33·33 |
| SB-16 .. | 16·78 | 45·79 | .. | 32·83 | 41·50 | 14·55 | 0·490 | 33·33 |
| C.D. at 5% .. | Not significant | Not given | 9·13 | 7·17 | 5·63 | 3·67 | 0·108 | 6·20 |

* Expt. I was a demonstration trial.

The data in Table I show that only in the case of Delhi the control showed 16 nodules per plant, since soybean has been grown earlier in this area while nodulation of soybean had

Since peat carried a higher moisture content as compared to soil and could take more of the inoculum, the use of peat based culture has an obvious advantage of higher survival

on seed giving rise to better establishment and infection leading to an increase in nodulation and yield. The result of this peat culture trial showed that the yield of soybean could be increased by inoculation with Indian strains of soybean *Rhizobium*. It was time that these cultures were multiplied on a large scale and used in future.

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## ON THE OCCURRENCE OF SUPERNUMERARY CHROMOSOMES IN THE GENUS *APLUDA*

*Apluda* is a monotypic genus belonging to the tribe *Andropogoneæ*, of grasses. It has a wide distribution in E. Tropical Asia extending from Mauritius and Socotra in the Indian Ocean, through India, Ceylon, Malaya, China and Formosa to the distant islands of the Pacific Ocean. It has also been reported from Australia. Linnaeus in 1753 described the unawned form of this grass as *Apluda mutica* and the awned one as *A. aristata* in 1756. Heckel in 1889 combined both these into a single species *Apluda varia* of which he had two subspecies, *subsp. aristata* and *subsp. mutica*.

The single species *Apluda varia* of Heckel is, according to Hooker (1897), both "unstable and polymorphic". Bor (1960) has merged the two subspecies and their varieties under *Apluda mutica* Linn. According to him, "This species needs a thorough investigation by the methods of experimental taxonomy".

Bombay specimens are referable to the subspecies *aristata* in Cook's *Flora of Bombay* (1908).

It is a slender variable grass growing extensively on the slopes of Trombay Hill. It is considered a good fodder grass for horses. Twelve plants selected at random were examined cytologically. Of these, eight showed 10 bivalents at meiosis in pollen mother cells, while in the remaining four—one or two supernumerary chromosomes were seen, besides the 10 bivalents. These supernumeraries were smaller than the normal chromosome complex with which they did not pair. They failed to congress on the metaphase plate and were distributed at random to the poles.

The origin, distribution and evolutionary significance of these supernumerary chromosomes may throw light on the polymorphism exhibited by this widely distributed genus which has been relegated by Hooker into a separate subtribe in the great family of grasses. It is possible that a more extensive survey in other parts of India might reveal the existence of polyploids in the species.

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## ERADICATION OF SEED INFECTION OF BLACK ARM OF COTTON

THE adjustment of date of sowing of cotton[1,2] and regular spraying with antibiotics and fungicides,[3-5] no doubt, reduce the disease incidence, but are of limited value. The most potent method of controlling a disease is to eliminate it at the initial source of inoculum, and to this end seed-dressing in case of seed-borne pathogens, is extremely valuable. As the black arm of cotton is normally externally and sometimes internally seed-borne,[6] chemical control of *Xanthomonas malvacearum* (E. F. Smith) Dowson, the causal organism, has been practised mainly through seed-dressing in conjunction with resistant varieties. Such a treatment gives better germination and also reduced or even eliminated the number of foci from which secondary infection could spread.

In order to eradicate the seed infection of black arm of cotton the seeds of cotton (LL-54, a cultivar of *Gossypium hirsutum* L.) were artificially infected with a virulent mixture of races[7] of *X. malvacearum* and given chemical or hot water treatment. The results were recorded on the basis of disease incidence on cotyledons.

Of the various chemicals used, including fungicides, antibiotics, copper and mercury derivatives, it was observed that plantvax (2, 3 - dihydro - 5 - carboxanilido - 6 - methyl -