

procedure adopted by Ramos and Shavdia³. We used King's B agar medium in place of proline agar⁴ and confirmed Koch's postulates in the laboratory.

The association of *Pseudomonas syringae* with "die-back" or blight of coffee appears to be the first report from India. The disease was earlier recorded from South America and Kenya^{5,6}. The symptoms described from Kenya, especially Mount Elgon and Solai appear to be similar to those observed by the present authors in Karnataka.

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PERPETUATION OF BLAST PATHOGEN IN RICE STUBBLES

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THE rice blast pathogen *Pyricularia oryzae* Cav induces local lesions on host organs under favourable

environment. The lesions on ragi leaf sheath were reported to serve as inoculum source after cutting¹. The rice plant can regenerate tillers after harvest. Hence, the role of stubbles of the diseased plant in the perpetuation of rice blast fungus was studied and the results are reported in this communication.

The stubbles of blast-infected rice crop were collected from the field (average day/night temp. 29°C/21°C). The old plant material surrounding the culm was removed. It consisted of dried leaf sheaths, prophyllum and non-panicle bearing dead tillers. The plant parts dried and shrank together, thereby, the separate identification of each part became difficult. The term "debris" was used to describe them. The old plant material was divided transversely into two parts, the upper half included the cut ends of stubbles and the lower half surrounding the lower node. The debris and the innermost leaf sheath were separated for both the pieces, and were further divided into 20 × 5 mm samples. The stalk was longitudinally divided into two parts to see the colour of axillary bud. The debris, innermost leaf sheath and stalk culm samples were incubated under high humidity at 25 ± 1°C temperature for about 20 hours. The samples were subsequently observed under microscope and the fungal flora present on them was recorded.

The viable *P. oryzae* conidia were observed from the lower half of innermost leaf sheath and the stalk-culm samples. These plant parts were free from saprophytic fungi whereas numerous *Fusarium*, *Alternaria* and *Curvularia* spores were found to be present on debris and near the cut ends of stubbles (table 1).

The axillary bud was dark brown in colour. The *P. oryzae* cultures isolated from stubbles were of wild type (dark coloured) and survived well for four months at 30–39°C without subculturing.

The pathogen was virulent but it could not compete with facultative saprophytes and hence was not de-

Table 1 The fungal flora present on stubbles of blast infected rice crop

Host organ	Fungal flora present			
	<i>Fusarium</i>	<i>Alternaria</i>	<i>Curvularia</i>	<i>Pyricularia</i>
(1) *Dead plant material				
(a) Debris of upper half	+	+	+	0
(b) Innermost leaf sheath of upper half	+	+	+	0
(c) Debris of lower half	+	+	+	0
(d) Innermost leaf sheath of lower half	0	0	0	+
(2) Stalk culm	0	0	0	+

* refer materials and methods; + = Present; 0 = Absent

tected from debris and the air exposed host organs. The culm is a vital storage organ of rice plant² and bears the axillary buds in the the nodes which give rise to ratoon³. *P. oryzae* being facultative parasite preferred to stay close to dormant host and perpetuated on stalk-culm and innermost leaf sheath. It produced lesions on young ratoon leaves.

Rice ratooning is considered as a practical means of increasing rice production per unit area and per unit time but the blast disease of rice may become a serious problem for this advantageous cropping system.

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EFFECT OF POTASSIUM EMBELATE, A NOVEL ANALGESIC COMPOUND ON THE NEUROTRANSMITTER CONTENT OF CEREBROSPINAL FLUID OF DOG

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EMBELIN is a *p*-quinone principle found in the fruits/seeds of *Embelia ribes*. Potassium embelate has been experimentally shown to be an orally effective, centrally-acting non-narcotic analgesic. It possesses most of the pharmacological properties, including analgesic of morphine but, unlike the latter, it is devoid of any addictive properties¹. The neurotransmitters in the brain have been suggested to play an important role in the analgesic action of several drugs. In the present work, the effect of potassium embelate is studied on the levels of noradrenaline, serotonin and histamine and also the acetylcholinesterase activity in the cerebrospinal fluid (CSF) of the dogs, with a view to understanding the involvement of these neurotransmitters in the modulation of antinociception induced by potassium embelate.

Potassium embelate was administered orally at a dose of 20 mg/kg in Mongrel dogs (8–12 kg), maintained in uniform husbandry conditions. The cerebro-

spinal fluid was collected at different time intervals as indicated (table 1) from lateral cerebral ventricle of the dogs according to the method reported by Bhargava and Tangri². Serotonin was assayed by the colorimetric method of Udenfriend *et al*³ Crout's procedure was adopted to estimate noradrenaline⁴. Histamine was estimated by the method of Shore *et al*⁵. Acetylcholinesterase activity was determined by the method of Pilz⁶. Significance of the difference was calculated by the student's *t*-test.

Earlier it has been shown that the analgesic effect of potassium embelate increased in the early period (0–15 min) and reached a maximum at 30–60 min after treatment. This effect was diminished by 90 min¹. At similar time intervals (0, 15, 30, 60 and 90 min), after treatment with potassium embelate, the levels of biogenic amines and enzyme activity was measured in the dog CSF.

It was observed that due to potassium embelate, the changes in the values of serotonin and histamine recorded at different time intervals did not attain the level of statistical significance, when compared with control value (at '0' time). On the other hand, the noradrenaline content in the CSF, measured at different time intervals showed significant change as compared with the control. The values recorded an increasing pattern and reached the maximum by 90 min after the drug treatment ($P < 0.001$).

Further, the activity of acetylcholinesterase recorded at each time interval was significantly different when compared with control ($P < 0.001$). This showed a decreasing pattern with time upto 90 min.

The present results showed that since under the influence of potassium embelate the levels of serotonin and histamine were not altered, the potassium embelate-induced analgesia may not be dependent on serotonergic and histaminergic systems, which have been considered to play an important role in morphine-induced analgesia^{7,8}.

However, an increase in the level of noradrenaline and decrease in the activity of acetylcholinesterase, which in turn would lead to an increased accumulation of acetylcholine, tends to suggest the possible involvement of central cholinergic and catecholaminergic pathways in the potassium embelate analgesia. There is good agreement in the literature concerning the role of these systems in analgesia. A specific interaction of analgesic compounds with central cholinergic mechanism has been suggested⁹. Besides, noradrenaline has been implicated as the major neurotransmitter at the spino-thalamic pathway, which transmits nociceptive impulses¹⁰.