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No.	Egg period in days.	Larval period in days.	Pupal period in days.	Total life-cycle in days.
9	5	32	8	45
10	3	22	7	32
11	3	22	9	34
12	3	23	10	36
13	3	25	10	38
14	3	27	10	40
15	3	24	11	38
16	3	26	9	38
17	3	25	10	38
18	3	26	10	39
19	3	26	10	39
20	4	26	12	42

Natural enemies. A Braconid larval parasite and a Chalcid pupal parasite were recorded from the field material.

Control. Sapota does not admit of any costly control measure. Spraying with Calcium arsenate at a strength of $\frac{1}{2}$ ounce in one gallon of water gives effective control. Spraying with a decoction of *Thevetia neriifolia* kernels at a strength of one ounce in one gallon of water was tried and the caterpillars which got a direct hit of the spray died in a few hours but those which kept inside the webs escaped injury. As a single caterpillar attacks a number of buds and leaves and since moths lay eggs purposely in old frass and webs, it is desirable to remove and destroy all infested material to minimise injury and reinfestation.

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Experiments on Ergot production in Madras.*

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Introduction. Ergot is the hard violetish-black sclerotium of the fungus *Claviceps purpurea* produced on the earheads of certain cereals and grasses. The fungus infects the young ovary and finally replaces the grain with the sclerotium. Ergot is a valuable source of medicine recognized alike in *British Pharmacopoeia* (B. P.), *Pharmacopoeia of the United States of America* (U. S. P.), *Prescriptio Internationalis* (P. I.) etc. The ergot of commerce is chiefly obtained from rye, crops of which get natural infection from year to year. The ergot of sheep's fescue grass, though very much less abundantly obtained, is valued very much higher by manufacturing

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chemists by virtue of its high alkaloid content. There are about 10 alkaloids known to occur in ergot, of which ergo-metrine B P. (called ergonovine in U. S. P.) is reported to be the most valuable. Ergotoxine and ergotamine are other valuable alkaloids (Cunningham 1941). Ergot contracts the arterioles and unstriped muscles and is a powerful ecbolic (agent which accelerates labour) and a haemostatic (agent which arrests bleeding). It is used in obstetrics, migraine spinal and cerebral congestion, internal haemorrhage, in paralysis of the bladder and *diabetes mellitus* (Dorland 1935). Besides these peace time uses, it is largely required during war for the treatment of wounded personnel of the fighting forces and air-raid victims.

The present supply position. The demand for ergot increases enormously during war. The world's supplies used to come from continental European countries like Spain, Portugal, Russia, Poland, Hungary and the Baltic States, where the fungus is endemic and produces natural infection of rye. The sclerotia are collected at harvest time. The present war has cut off Great Britain and most non-European countries from their usual sources of supply. British requirements which are reported to be 50 tons per year are in extreme deficit. Last year the British Health Ministry appealed for large quantities of ergot for the treatment of war casualities (Hynes 1941). In the years preceding 1921 the United States of America used to import 58–112 tons of ergot annually from Europe (Bonns 1922). The annual requirements of chemists and pharmacists in Germany in the last decade was about 40,000 kilograms (about 40 tons) (Jaretsky 1935). India like Britain has in the past depended entirely on foreign sources for her civilian and military needs. At the moment there is a dearth for ergot preparations in India and issues from medical stores to hospitals and veterinary institutions are severely restricted. Prices of ergot preparations have soared high and the production of ergot in India in the immediate future will therefore be a substantial contribution to the Empire War Effort. Large-scale production within the country would be helpful not only to meet the urgent needs of India's fighting forces and civil population, but also to relieve Great Britain and the allied countries of their difficulties in obtaining an essential war commodity. New Zealand had set apart a substantial sum in 1941 for the purchase of ergot to be exported to Great Britain (Bell 1941). Any effort to make India self-sufficient and independent of foreign supplies would help the country to win the peace that follows the war. Moreover, ergot deteriorates in storage and the great variations recorded in the alkaloid contents of apparently identical samples, suggest the need for a home-grown produce of reliable quality from which standard preparations of known potency could be prepared and made available at a price which suits the pockets of the poorer classes.

Records of ergot in India. *Sphacelia sorghi* which causes the sugary disease of sorghum is prevalent in Bombay and Madras provinces. This fungus is believed to be the conidial stage of a species of *Claviceps*.

Typical sclerotia (or the ergot stage) of the fungus have not been observed nor has any attempt been made to determine the alkaloid content of the sphacelial stage. *Sphacelia* sp. has been recorded from other grasses also. Pushkarnath and Padwick (1941) have reported the occurrence of ergot sclerotia in the neighbourhood of Simla on *Brachypodium sylvaticum*, *Oplismenus compositus* and *Andropogon* (*Gyrilla ?*) sp. in 1941. For want of the ascus stage, they were not able to determine the species, but opined that it may be *C. purpurea* or *C. pusilla* though the measurements of conidia did not quite agree with those of *C. purpurea*. No attempt has been reported to determine the alkaloid contents of the sclerotia, so that the value of the indigenous fungus is still unknown.

Ergot culture in the Nilgiris. Following the appeal of the British Health Ministry in 1941, several empire countries made trials in ergot culture by the artificial inoculation of rye flowers. The rye fungus not being recorded in India, cultures of the fungus were obtained in April, 1942 from Australia and exploratory experiments were carried out at the Agricultural Research Station, Nanjanad. The fungus was multiplied on a variety of natural and synthetic media. Over 2½ acres of rye were sown from April onwards. The earliest sown crop came into ear early in July. The field was divided up into several blocks and spraying trials were conducted in mid-July as per a schedule. The weather was very wet with frequent drizzles of rain or heavy mist. Examination of the fields made at the beginning of August failed to show any signs of infection. A second series of sprayings was started on the 11th of August. This spraying was done when most flowers were open and the anthers extruded. Fifteen days after the second spray several sclerotia were observed. Closer examination revealed the 'honey-dew' stage on several earheads. House-flies were attracted to the 'honey-dew.' Infection started spreading over the whole field including the unsprayed blocks. There was, however, a great variation in the intensity of infection and in the number of sclerotia formed per head. Fields which flowered last showed the heaviest infection. Spray inoculations done on a crop of rye which flowered in a drier period (October) were comparative failures. Mature sclerotia were dark in appearance with a violet tinge at the base, curved or straight and with a longitudinal fissure on the side. Those formed in singles or twos on an ear were bigger in size (28—40 × 3—8 mm.) than those which were formed in larger numbers (11—25 × 2—5 mm.). The maximum number so far observed on a single ear is 14. The usual number is very much less. Harvest figures from these blocks showed that up to 120 lb. of sclerotia (wet weight), equivalent to 95 lb. of sun-dried sclerotia, could be produced per acre under favourable conditions. The following statement summarises the results of spraying experiments :

Statement showing the results of infection experiments on rye with *Claviceps purpurea* (average of six estimations).

Field No.	Date of spraying.	No. of sprays.	Area marked out	Average no. of tillers.	Average no. of infected tillers.	Percentage of infection	Average no. of sclerotia per earhead	Maximum no. of sclerotia per earhead
21	14th July	1	¼ cent.	2732	27	0 98	3	4
22	18th July	1	,,	1221	43	3·52	4	6
21	13th and 18th July	2	,,	2093	24	1·14	3	5
16	11th and 14th August	2	,,	1324	93	7·1	6	14
21	12th, 15th & 18th July	3	,,	2164	57	2·63	4	8
21	12th, 14th & 18th July 11th & 14th August	5	,,	2106	198	9·4	6	9
22	Control		,,	1634	15	0·91	3	5

Quality of Nilgiri produce. Ergots are known to vary in their alkaloid contents. The minimum standard prescribed in *British Pharmacopoeia* is 0·05 per cent of the alkaloids. A recent report from New Zealand (Neill 1941) stated that a strain of the fungus obtained from Hungarian commercial ergot gave heavy infections on rye blossoms and produced up to 176 lb. of air dried ergot per acre, but the produce was entirely lacking in alkaloids. We were however, fortunate that our produce has been much above the standard. The following is the report from the Research Officer, Madras Medical College on Nilgiri ergot.

"The sample sent by you has been chemically assayed by the method described in *The British Pharmacopoeia* and the total alkaloid content of the sample compares very favourably with the best European specimens of ergot. Biological assay also confirms this finding".

Cultural studies. A number of natural and synthetic media were used to grow the fungus. The growth was poor on Quaker oats agar and scanty on French bean agar. It produced a fair mealy white growth on a medium containing maltose, peptone, malt extract, potassium di-hydrogen phosphate and magnesium sulphate, but sporulation was poor. The best medium proved to be that recommended by Kirchhoff (1929). On this a thick white profusely-sporing growth is produced which changes to cream with age and develops several folds on the mat of mycelium. The spores are oval or oblong, hyaline and one-celled. Some spores were abnormal in length and showed curvature. When the culture was about 2 months old, the substrate developed a violet colour and the fungal growth became greyish white. Sclerotia were never produced on agar media. On a similar medium in which KNO_3 replaced asparagin, the growth was fairly good and spores abundant.

Trials were made to grow the fungus on sterilized plant tissues. It makes a satisfactory though slow growth on sterilized rye grains. Different proportions of rye to water were tried. Among three proportions tried (viz. 1:1; 3:2 and 2:1) the best growth was in the 1:1 ratio. Another medium tried was that recommended by Kreitmair and Kussner (1931) consisting of rye meal, asparagin, glycerine and water. This medium produces a good matty growth and sporulation. The fungus grows fairly well on crushed grains of malted sorghum, but not to the same extent as on rye grains. Sterilized bits of sugarcane made alkaline by the addition of potassium hydroxide, produced a slow but thick white growth, but sporulation was scanty. Sterilized immature panicles of sorghum, *Setaria italica* and *Pennisetum typhoides* form a good medium for the cultivation of the fungus. The optimum temperature for growth was round about 20°C.

Cost of production. It is not possible to furnish correct figures of the cost of production from experimental fields where sub-plots were variously treated. But judged from the results of preliminary experiments conducted this year, it may be estimated that the cost of production of ergot under optimum conditions on the Nilgiris will work to about Re. 0—4—0 a pound of dried ergot. The following data give an idea of the cost of production.

Cultivation expenses for rye per acre	...	**Rs.**	**16.**
Labour for conducting 3 sprayings (6 men @ 0—8—0 each)	...	,,	**3.**
Labour for hand-picking ergot (12 boys at 0—4—0 each)	...	,,	**3.**
Labour for cleaning the ergot	...	,,	**1.**
Total	...	**Rs.**	**23.**

At 95 lb. of ergot per acre the cost per pound will be nearly four annas. The value of rye grain and straw harvested have not been taken into account in estimating the cost of production.

Possibilities for ergot production in South India. The suitability of South Indian hill tracts for growing rye, the excellent quality of the product obtained from Nilgiris, the availability of a good strain of the ergot fungus, and the valuable knowledge now gained from exploratory experiments, open out possibilities for large-scale production. The chief obstacle facing us at the moment is the limitation of rye seed. But this can be remedied in the course of six to nine months. Ergot fetches a price of about 11 sh. per lb. (Hynes 1941). At an average price of Rs. 6 per lb. and a conservative yield of 50 lb. per acre, the gross return from an acre would be Rs. 300. Apart from profit, the urgent needs of the country and the Empire are sufficient incentives for immediate action.

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A Proliferation of the Sorghum Spikelets.

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An interesting phenomenon of proliferation of a sorghum earhead was observed in the summer season of 1940 in a seed multiplication plot of an yellow grain sorghum strain (A. S. 809). While removing rogues at the flowering time, one earhead was observed to have rather longer spikelets, though in other respects, the plant was normal. The plant was as well developed and as tall as its neighbours, and the size and shape of the earhead also appeared normal. A closer examination of the earhead revealed that the fertile spikelets had not opened. While the spikelets of the normal plants were awned, the awns being about one centimetre in length, there was a complete suppression of the awn in the proliferated earhead. It was also observed that the spikelets in the basal regions of the earhead were reduced to scale-like structures.

A few days later two more earheads with proliferated spikelets were obtained from a neighbouring field sown with the seed of the same stock. This field was also sown about the same time as the previous one and the plants in this also flowered about the same time. In these earheads it was observed that some of the spikelets had developed into seedlings, which appeared like normal sorghum seedlings about a fortnight old.

A few seedlings were detached from the earhead and kept in water for examination. They developed roots. These and a few more seedlings from one of the earheads were planted in pots filled with soil. All of them survived, grew up and in about 50 days developed earheads. These earheads also were abnormal. The spikelets were longer and developed into 'seedlings'. Seedlings from this when about three weeks old were again planted. The abnormality was thus perpetuated.

In the second generation raised in pots it was observed that the seedlings developed roots while still attached to the earhead, as they were