

## Observations on wheat rusts in Madras State

by

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In Madras State the cultivation of wheat is limited to an area of about 2500 acres in all. The major portion of the area is on the Nilgiris and Pulneys and the hills of Salem and North Arcot Districts. In the plains the total extent under this crop may not exceed a hundred acres (in Coimbatore, Salem and Madura Districts). Two crops are raised in a year on the hills while in the plains wheat is sown only during the cold season from November onwards.

On the hills the main variety under cultivation goes by the name of 'Samba' wheat—*Triticum dicoccum*. The ears are awned and the grains are enclosed in the glumes. After harvest, husking is necessary to separate the grains. The local population has a partiality for this hard-grained variety on account of its suitability for the special method of utilisation as whole grain or semolina as practiced in the tract. In recent years either through departmental propaganda or on the growers' own initiative, varieties of wheat belonging to *T. vulgare* have been tried on the Nilgiris. Though increased yields of grain have been obtained from some of them, their cultivation has not extended as these are mostly suitable for making flour only.

Although the acreage under wheat in this state is limited, it is affected by all the three rusts known on this crop, viz., black rust—*Puccinia graminis*, brown rust—*P. triticina* and yellow rust—*P. glumarum*. Of these three rusts the last is known to occur only on the hills where it has been observed on wheat, barley and a grass, *Bromus catharticus*. The two other rusts are prevalent on the hills and the plains. The brown rust is the most wide-spread and is the first to appear on the crop. Black rust incidence occurs invariably much later. Owing to the prevalence of these rusts legislation had been enforced to suspend the cultivation of the summer crops in this state in some years.

The 'Samba' wheat on the hills exhibits high field resistance to black rust. But the 'Vulgare' wheats like N. P. 111 and 165 and other unnamed varieties are heavily rusted. However in the plains the 'Samba' wheat is also as heavily infected by black rust as the 'Vulgare' varieties. The higher temperature prevalent in the plains

favours the infection. Seeds of 'Samba' wheat were obtained from the Nilgiris and sown at Coimbatore. The resulting crop exhibited over 40 per cent crop infection, individual plants sometimes having 100 per cent plant infection. A crop raised from the same lot of seeds at Keti (Nilgiris) was not infected by black rust. This freedom from rust at Keti is mainly due to the differences in the climatic conditions.

Direct control of the rusts of cereals by the use of fungicides is neither economical nor practicable under field conditions. Therefore the main line of attack for the control of the rusts has to be through the cultivation of rust resistant varieties. This again is beset with difficulties as it is well nigh impossible to get agronomically satisfactory varieties exhibiting resistance to all the races of the three rusts. By analysis of samples sent from different parts of the state to the wheat-rust-testing station at Simla the races prevalent in this tract have been ascertained through the help of the Head of the Division of Mycology, Indian Agricultural Research Institute, New Delhi. These are recorded hereunder.

TABLE I  
*Races of rusts prevalent in Madras State*

Years	Black rust	Brown rust	Yellow rust	Authority
1932 - '37	15, 10, 42	10, 20, 63, A, B	13, 19, 20, A, F	Mehta (1940)  Head of the division of Mycology, I.A.R.I. New Delhi.
1950 - '51	21	63, 107	19	
1951 - '52	21, 34, 42	11, 20, 26, 63, 106, 107	19	
1953 - '54	21, 34, 40, 42, 194, and C	10, 11, 20, 26, 63, 106, 107 and 108	19	

The above analyses indicate that only a limited number of races occur in this State. However, slight differences are evident in the races prevalent during different years. In order to identify the races of black rust prevalent in Coimbatore and Wellington, seeds of the twelve differential hosts were obtained through the courtesy of Dr. R. S. Vasudeva from New Delhi. These were grown in pots at Coimbatore and inoculated with a rust sample collected locally. The rust was found to belong to the race 21. The seeds of the differential hosts were also sown in small plots in a wheat field at Wellington. There was natural infection from the neighbouring

wheat crop and from the reaction on the differential hosts the race 21 was found to be prevalent in this area also. The analyses made by the division of mycology, New Delhi, also showed that the race 21 occurred in the samples sent every year. This race appears to be widespread. A new race has been isolated from Coimbatore on Kenphad 28 by the Head of the Division of Mycology, New Delhi during the last season. This variety was only very recently introduced into Coimbatore from Bombay State. The occurrence of a new race of the rust on this newly introduced variety raises a new problem. The introduction of new varieties from outside may lead to the development and the spread of new races of the pathogen and thus complicate the breeding programme for resistant varieties.

In order to improve the yield of wheat in this State by the introduction of rust-resistant varieties, attempts were made from time to time to obtain from other parts of India and from outside the country reputed rust-resistant varieties and grow them at Coimbatore and the Nilgiris. The varieties suitable for the plains did not always come up well on the hills. Further, their reaction to the rust was also modified in certain cases by the change of the venue. The varieties tried and their reactions are given in Table II.

These trials have shown that 'Samba' wheat is not intrinsically resistant to black rust. At higher elevations however this variety exhibits low infection by this rust under field conditions, presumably influenced by the differences in the climatic conditions. But the same variety under the Coimbatore conditions becomes heavily rusted. In both the localities it is highly susceptible to brown rust. The variety 'Gabo' also exhibits low incidence of black rust on the hills. It gives more than the twice the yield of 'Samba' but the grains are not hard enough to satisfy the requirements of the local population. Hence its spread is not as rapid as expected. In the plains however this variety is also severely infected by black rust. Among the others, the variety, 184. P2 A. I. A., from Kenya is not affected by black rust but is susceptible to brown rust. It did not appear to be suitable for cultivation at higher elevations. Even at Coimbatore it was found to be of longer duration than 'Samba'

In 1954 a new variety called Spica T. S. K. P. F. 4601 was obtained from Australia through the good offices of the Indian Council of Agricultural Research. A portion of the seed was sown

TABLE II.  
Field reaction of different varieties of wheat.

Variety	Place of origin	At Coimbatore		On the Nilgiris		Remarks
		Percentage of crop infection		Percentage of crop infection		
		Black rust	Brown rust	Black rust	Brown rust	
Gabo	Australia	80	60	10	30	Good growth, high yield grain not so hard as Samba
Charter	"	15	60	5	40	Soft grained
Kendee	"	60	80	10	40	Grain as hard as that of Gabo
Colebration	"	60	80	20	60	Not so good as Gabo
Yalta	"	Not tried		40	60	Soft grained
Kenphad 34	Niphad (Bombay)	20	80	Not tried		Plant infection by black rust less than 5 per cent
" 28	"	30	100	5	60	Yield better than Samba
" 25	"	50	100	Not tried		Not tried
No. 177	"	70	100			Not satisfactory
Hofed	"	40	100			"
N. P. 105	I. A. R. I. New Delhi	100	100	80	80	Heavily infected
360 H.	Kenya (through the I. A. R. I.)	5	60			Did not flower
338 A. A. I. A <sub>2</sub>	"	10	40			Longer duration than Samba
337 BE <sub>2</sub> F <sub>2</sub>	"	20	60			"
184 P <sub>2</sub> A. I. A.	"	nil	30			"
Samba	Anikorai (Nilgiris)	40	100	5	90	Yield low. Heavy infection by brown rust
Samba	Coimbatore	60	100	6	90	"

Did not grow satisfactorily at Ootacamund

Longer duration than Samba  
Low yield



at Keti in May 1954 and compared with Kenphad 28, 184 P2 A. 1. A. and 'Samba'. This variety was completely free from black or brown rusts while there was heavy incidence of brown rust in the others. Black rust was rare in the other varieties too. The duration of the variety was of the same extent as 'Samba' while the yield was more than twice as much. The two other varieties came to harvest only one month later and the yield was lower than that of Spica. However this is the first year of trial and the merits of the variety could be judged only after further trials. Its freedom from both brown and black rusts under field conditions and the high yield obtained indicate that it may turn out to be useful for cultivation on the hills. The farmer in whose land the variety was grown is anxious to multiply the same in preference to 'Samba'. Its suitability for the plains is yet to be tested.

The studies conducted so far indicate that more attention should be directed towards the evolution of high yielding rust resistant strains of 'Samba' wheat for the South Indian conditions. The 'Vulgare' wheats though higher yielding are not favoured by the local people. Further, resistance to brown rust is more to be kept in mind for the strains grown in this state. This rust is the earliest to appear and causes more damage in this state.

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