Screening of varieties for resistance to false smut (*Ustilaginoidea virens* (Cook) Tak.) disease of rice

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ABSTRACT

Twenty rice varieties were screened for resistance under wet land field conditions against false smut disease of rice caused by Ustilaginoidea virens (Cook) Tak. at two locations, during 2012-13 in Kerala, India. Observations were made on the per cent infected tillers and disease severity. The varieties were categorized on the basis of their disease reaction into five groups i.e., highly resistant, resistant, moderately resistant, susceptible and highly susceptible. Out of the twenty varieties screened, the varieties Harsha and Vaishak released from Regional Agricultural Research Station Pattambi, Palakkad were found highly resistant (completely disease-free) and the varieties, Makom, Thekkancheera, Pavizham and Karthika were found resistant (disease severity score <1%) to the disease. The varieties Kanakom, Revathi and Prathyasha showed moderate resistance. The variety Uma was found highly susceptible to the disease. Future breeding programmes for resistance against the disease can be focused on the resistant varieties Harsha, Vaishak Makom, Thekkancheera, Pavizham and Karthika.

Rice false smut disease caused by *Ustilaginoidea virens* (Cook) Tak. has been considered as a minor disease world over. In India, the disease was called as 'Lakshmi' disease as an indication of a bumper harvest. In recent decades, a tremendous increase has been observed in the incidence and severity of this disease, and presently, the disease has assumed the role of a major disease. The disease has been reported to occur in moderate to severe intensity from the year 2000 onwards in India and causes both qualitative and quantitative losses (Ladhalakshmi *et al*., 2012). Severe outbreaks of the disease has been reported from Assam (Baruah *et al*., 1992), Chhattisgarh (Singh and Pophaly, 2010), Andhra Pradesh, Bihar, Gujarat and Eastern Uttar Pradesh (DRR, 1990). The current strategies for management of the disease include adjustment of planting time, use of resistant varieties, avoiding indiscriminate use of nitrogen fertilizers, destruction of collateral hosts and spraying with chemical fungicides. So, far there are only very few varieties reported from India showing resistance against this disease. So, the present work has been undertaken to screen twenty varieties of rice for resistance against false smut disease of rice.

Twenty red kernelled varieties of rice (Table 1) were screened for resistance against false smut disease of rice caused by *Ustilaginoidea virens* (Cook) Tak. under wet land transplanted field conditions at the experimental fields at Rice Research Station Moncompu, Alappuzha and Regional Agricultural Research Station, Palakkad during 2012-13 in Kerala, India, during two seasons, Kharif and Rabi. The design followed was Randomized Block Design with three replication was recommended dose of manures and fertilizers were provided as per the Package of Practices, Kerala Agricultural University (POP, 2011) and no fungicides were applied. Areas having previous disease history with natural disease pressure were selected for planting and no artificial inoculation methods were followed. Observations were made as per cent

Table 1. Details of the varieties screened against false smut disease of rice

Treatments	Station of release	Duration	Details	Average Yield (t/ha)
Bhadra	RRS, Moncompu	120-140	Red, short Bold	4.5-5.5
Pavizham	RRS, Moncompu	115-120	Red, short Bold	5-6
Karthika	RRS, Moncompu	110-115	Red, Medium Bold	6-6.5
Aruna	RRS, Moncompu	100-110	Red, short Bold	5.5-6
Makom	RRS, Moncompu	100-110	Red, short Bold	6-6.5
Kanakaom	RRS, Moncompu	120-125	Red, short Bold	5.5-6
Remanika	RRS, Moncompu	100-105	Red, short Bold	6-6.5
Uma	RRS, Moncompu	115-120	Red, Medium Bold	6.5-7
Revathi	RRS, Moncompu	105-110	Red, Medium Bold	5.5-6
Krishnanjana	RRS, Moncompu	105-110	Red, Medium Bold	5-5.5
Gouri	RRS, Moncompu	115-120	Red, Medium Bold	5.8
Prathyasha	RRS, Moncompu	100-110	Red, Long Bold	5-5.5
Bhagya	RRS, Kayamkulam	95-100	Red, Medium Bold	4.35
Vytila	RRS, Vytila	115-120	Red, Medium Bold	4.5-5
PTB-10	RRS, Moncompu	90-100	Red	2.5
Jyothi	RARS, Pattambi	105-110	Red, Long Bold	6
Kanchana	RARS, Pattambi	105-110	Red, Medium Bold	5-5.5
Athira	RARS, Pattambi	110-115	Red, short Bold	5-5.5
Harsha	RARS, Pattambi	105-110	Red, Long Bold	4-5
Vaishak	RARS, Pattambi	117-125	Red, short Bold	2.2-3.9

infected tillers by dividing the total number of infected tillers per plot to the total number of tillers per plot multiplied by 100 and as disease severity by multiplying the per cent infected tillers with the per cent infected grains. Per cent grains infected per panicle was calculated as an average of 20 smutted panicles. The varieties were categorized on the basis of their disease reaction into five groups *i.e.,* highly resistant (completely free from the disease with a disease severity index of 0), resistant (disease severity value <1), moderately resistant (disease severity value 1-5), susceptible (disease severity value 5-20), and highly susceptible (disease severity value > 20).

Out of the twenty varieties screened, the varieties Harsha and Vaishak released from Regional Agricultural Research Station Pattambi, Palakkad were found highly resistant (completely disease-free) and the varieties, Makom, Thekkancheera, Pavizham and Karthika were found resistant (disease severity value < 1) to the disease (Table 2). The varieties Kanakom, Revathi and Prathyasha showed moderate resistance with a disease severity value of 1-5. Ten varieties *viz.*, Bhadra, Aruna, Remanika, Krishnanjana, Gouri, Bhagya, Vytila 6, Jyothi, Kanchana and Athira were found susceptible to the disease with 5-20 disease severity index (Table 3). The variety Uma was found highly susceptible (severity value >20) to the disease.

The results indicate that the resistant varieties Harsha, Vaishak Makom, Thekkancheera, Pavizham and Karthika can be used as donor parents in future breeding programmes. The varieties *viz.,* Makom, Pavizham, Karthika and Harsha being comparatively high yielding, can also be recommended for cultivation in disease prone areas.

Singh and Singh (2005) screened 98 rice varieties against false smut of rice and found 28 varieties to be highly resistant to this disease. In a wet season field trial conducted at West Bengal, India, for assessing the field reaction of 41 rice hybrids, eight rice hybrids were found free from the disease (Biswas, 2001). Upon screening of seven rice varieties for false smut resistance in Nigeria, Ahonsy *et al*. (2001) reported the varieties, IRAT 170, and Ex-China to be highly resistant to the disease.

The resistance breeding programme can focus on the resistant varieties *viz.,* Harsha, Vaishak Makom, Thekkancheera, Pavizham and Karthika. The future line of work should emphasize the location of the resistant genes in the identified varieties and transfer of those genes to popular varieties. The relationships between the plant traits and disease resistance shall also be examined. Still more varieties, especially the landraces can be screened for uncovering the resistant

Table 2. Per cent infected tillers and disease severity of twenty varieties of rice screened against false smut disease of rice*

Varieties	%infected Tillers		Disease severity	
	Palakkad	Alappuzha	Palakkad	Alappuzha
Bhadra	4.00(2.23)	2.00(1.73)	10.58(3.4)	3.33(2.08)
Pavizham	0.63(1.28)	1.00(1.41)	0.63(1.28)	0.83(1.35)
Karthika	0.63(1.28)	1.00(1.41)	0.63(1.28)	0.83(1.35)
Aruna	1.64(1.62)	0.00(1.00)	6.54(2.74)	0.00(1.00)
Makom	0.29(1.14)	0.00(1.00)	0.29(1.14)	0.00(1.00)
Kanakom	1.64(1.63)	0.00(1.00)	3.28(2.07)	0.00(1.00)
Remanika	7.66(2.94)	2.00(1.73)	16.97(4.24)	4.24(2.28)
Uma	11.32(3.51)	4.00(2.24)	31.32(5.68)	13.33(3.79)
Revathi	0.99(1.41)	1.67(1.63)	4.00(2.23)	1.50(1.58)
Krishnanjana	2.65(1.91)	1.00(1.41)	7.94(2.99)	1.00(1.41)
Gouri	5.66(2.58)	2.00(1.73)	9.65(3.26)	3.64(2.15)
Pratyasha	1.64(1.63)	0.33(1.14)	3.28(2.07)	0.30(1.13)
Bhagya	5.66(2.58)	2.33(1.82)	5.97(4.12)	4.23(2.28)
Vytila 6	1.64(1.63)	0.00(1.00)	5.72(3.59)	0.00(1.00)
Thekkancheera	0.29(1.14)	0.00(1.00)	0.29(1.14)	0.00(1.00)
Jyothi	4.65(2.38)	1.00(1.41)	15.00(4.00)	1.80(1.67)
Kanchana	3.65(2.16)	1.33(1.52)	5.31(2.51)	1.20(1.48)
Athira	4.65(2.38)	0.00(1.00)	9.65(3.26)	0.00(1.00)
Harsha	0.00(1.00)	0.00(1.00)	0.00(1.00)	0.00(1.00)
Vaishak	0.00(1.00)	0.00(1.00)	0.00(1.00)	0.00(1.00)
SE	0.08	0.05	0.12	0.06
CD(P<0.05)	0.24	0.14	0.35	0.15

* Mean of three replications
Values in parenthesis are square root transformed values

Table 3. Grouping of twenty varieties of rice screened for resistance against false smut disease

Range of disease severity	Category	Name of varieties
0	Highly resistant	Vaishak, Harsha
<1	Resistant	Makom, Thekkancheera, Pavizham, Karthika
1-5	Moderately resistant	Kanakom, Revathi, Prathyasha
5-20	susceptible	Bhadra, Aruna, Remanika, Krishnanjana, Gouri, Bhagya, Vytila 6, Jyothi, Kanchana, Athira
>20	Highly susceptible	Uma

gene sources against the disease.

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