SHORT COMMUNICATION

Biodiversity and Improvement in *Kalanamak* – A Local Scented Rice Cultivar in Uttar Pradesh

RK Singh[1], US Singh[2] and Neelam Singh[2]

1 IRRI Liaison Office for India, CG-Block, NASC Building, New Delhi-110 012

2 G.B. Pant University of Agriculture and Technology, Pantnagar-263 145 (Uttaranchal)

Among small- and medium-grained aromatic rice varieties, *Kalanamak* is most important in India. It derives its name from its black husk. It is grown widely in Tarai Area adjoining Nepal particularly in districts of Gorakhpur, Maharajganj, Gonda, Mirzapur and Varanasi in Uttar Pradesh and West Champaran in Bihar. It is also cultivated in small pockets in district Kapilvastu of Nepal. History of cultivation of *Kalanamak* dates back to Buddha period. Till a decade ago about 10 per cent area was Kalanamak cultivated in the Sidharthanagar and Basti districts. However, due to severe panicle blast problem during the years 1998 and 1999, area under *Kalanamak* declined to less than 1 per cent. However, *Kalanamak* production is better than previous years in 2001 and high price (paddy Rs. 25 per kg and milled rice Rs. 45 per kg) definitely increase farmers' interest.

Kalanamak is a tall and late maturing variety. It belongs to Group V (Singh *et al.*, 2000). It has small- to medium-sized grain (4.3 to 6.4 mm), medium to strong aroma and about 150 per cent elongation after cooking. Elongation of *Kalanamak* after cooking is better than Taraori Basmati (80-100%). Cooked rice is fluffy, soft, non-sticky, sweet, and easily digestible with relatively longer shelf-life. In local market it earns higher price than Basmati. It surpasses Basmati in all other quality traits except grain length. This variety is highly suitable for organic farming as its nitrogen requirement is quite low.

In spite of the high quality, *Kalanamak* is poor yielder. There is no seed production or improvement programme. Farmers are using their own seed from hundreds of the years. This has resulted in decline in quality of seed. In a survey of the *Kalanamak* belt of district Sidharthanagar, it was found that this variety is now a mixture of several types of seeds, which share one major characteristic, *i.e.* black husk. Because of admixture, both quality and yield are adversely affected. However, it has certain advantages also. This variety behaves as multi-line. In its native areas of cultivation *Kalanamak* suffers less from different diseases and pests as compared to other cultivars or land races of aromatic races, collected from other areas.

Because of this mixture at farmers' field, flowering and maturity periods are also not uniform. Quite often they are spread-over to more than one week. Small-size slender grain lines are of superior quality. Proportion of this type of *Kalanamak* line is higher in Alidapur area of district Sidharthnagar, which is famous for producing finest quality *Kalanamak*.

In an attempt to quantify diversity in *Kalanamak*, 34 germplasm of *Kalanamak* were collected from districts of Sidharthanagar, Basti and Gorakhpur of Uttar Pradesh and West Champaran of Bihar. These germplasm were purified by single line selection and evaluated for various traits.

Table 1. Maturity duration and plant height of *Kalanamak* germplasm

Maturity duration		Plant height	
Days	Germplasm	cm	Germplasm
140	321	100-110	3130, 3131, 3222
143	3256	111-120	3113, 3128, 3168, 3212, 3213, 3219, 3312, 3319, 3320, 3321
158	3081, 3113, 3121, 3319, 3124, 3125, 3126, 3212, 3213, 3214, 3219, 3259, 3266, 3327	121-130	3081, 3114, 3117, 3124, 3125, 3126, 3214, 3216, 3257, 3266, 3327
160	3089, 3114, 3117, 3119, 3120, 3128, 3130, 3131, 3215, 3257	131-140	3089, 3120, 3121, 3215, 3220, 3256
162	3129, 3168, 3312	141-150	3119, 3122, 3259
165	3216, 3220, 3222		

As shown in tables 1 to 3, there is wide variation in different germplasm with respect to maturity duration, plant height, number of grains per hill, grain length (4.4 to 6.4 mm), breadth (1.5 to 2.9 mm) and length/ breadth ratio (2.3 to 3.6). Susceptibility of germplasm to various diseases and pests also varied widely (Table 3 and 4). One of the most interesting observation was high degree of resistance (index <5%) in some of the germplasm against panicle blast (Table 3). Some of the germplasm showing high or moderate degree of resistance against panicle blast were also superior in yield and other quality traits (Table 3 and 5). In a 20 m^2 plot many of these germplasm yielded more than 20 q/ha against 10 q/ha average yield at farmers' fields in their native areas of cultivation. In a survey it was observed that in its native area of cultivation farmers value dark coloured, small and slender grains more (Singh US and Singh RK, unpublished). These characteristics

Table 2. Grain characteristics (grain / panicle, grain length/breadth ratio) of *Kalanamak* germplasm

Grains per panicle		Length/Breadth ratio	
Number	Germplasm	Ratio	Germplasm
90-100	3113, 3266	≤ 2.5	3128, 3219
101-125	3081, 3130, 3215, 3216, 3222, 3256, 3320, 3321	2.6-3.0	3117, 3122, 3124, 3129, 3130, 3131, 3212, 3213, 3215, 3257, 3259, 3266, 3327, 3319, 3121, 3216
126-150	3089, 3117, 3119, 3125, 3257, 3259, 3312	3.1-3.5	3089, 3114, 3120, 3214, 3222, 3229, 3256, 3278, 3319
151-175	3121, 3122, 3131, 3168, 3319	≥3.6	3126, 3321
176-200	3114, 3120, 3214, 3219		
201-225	3126, 3128		
226-250	3213		
251-275	3124		
276-300	3327		

Table 3. Susceptibility of *Kalanamak* germplasam against different diseases

Disease Reaction	Neck blast	Sheath blight	Sheath rot	Stem rot
Resistant (R)	3114, 3121, 3128, 3130, 3131, 3213, 3216, 3220, 3259 3320		3117, 3119, 3120, 3131, 3212, 3213, 3259, 3319, 3320	3220, 3320
Moderately resistant (MR)	3081, 3089, 3119, 3120, 3126, 3130, 3168, 3214, 3215, 3256, 3266	3220	3089, 3113, 3114, 3121, 3122, 3124, 3126, 3128, 3130, 3168, 3215, 3216, 3219, 3220, 3222, 3257, 3321, 3327	3122, 3124, 3129, 3168, 3213, 3222 3327
Moderately Susceptible (MS)	3113, 3117, 3125 3129, 3202, 3327, 3329	3113, 3126, 3128, 3130, 3168, 3214, 3256, 3319, 3321, 3327	3081, 3266	3089, 3120, 3126, 3128, 3131, 3214, 3215, 3219, 3259, 3321
Susceptible (S)	3121, 3122, 3124, 3168, 3212, 3219, 3222, 3257, 3319	3081, 3089, 3114, 3117, 3119, 3120, 3121, 3122, 3124, 3125, 3129, 3131, 3212, 3213, 3215, 3216, 3219, 3222, 3257, 3259, 3266, 3320	3129	3081, 3113, 3114, 3117, 3119, 3121, 3130, 3212, 3216, 3257, 3266, 3319

Table 4. Incidence of white head in *Kalanamak* germplasm

Per cent incidence	*Kalanamak* fermplasm
≤ 10%	3113, 3117, 3126, 3128, 3219, 3222, 3257, 3319
11-15%	3081, 3114, 3119, 3120, 3124, 3129, 3130, 3131, 3168, 3212, 3213, 3214, 3216, 3220, 3256, 3259, 3266, 3320, 3321, 3327
>15%	3089

Table 5. Characteristics of some selected germplasm of *Kalanamak*

Germplasm	Plant Height (cm)	Duration (days)	Tillers/ hill	Panicles/ hill	Panicle length (cm)	Grains per panicle	Grain characteristics			Paddy yield (q/ha)*
							Length (mm)	Breadth (mm)	L/B	
3114	116	160	8.8	8.6	24	218	5.1	1.6	3.2	25
3119	136	160	8.4	8.4	24	205	4.6	1.6	2.9	25
3120	141	160	9.8	9.2	24	247	4.8	1.6	3.0	16
3130	107	160	9.4	8.8	30	203	5.9	1.9	2.6	23.5
3131	108	160	11.8	11.6	27	227	4.7	1.8	2.7	20
3216	125	165	8.2	8.0	22	202	4.7	1.6	2.9	13

* Based on 20 m^2 plot.

are shared by some of the blast resistant germplasm like 3114, 3119, 3131, 3216 etc. Therefore, they offer great promise for being exploited for the cultivation as improved lines. These germplasm are being evaluated in 100 m^2 plots in district Sidharthanagar and Gorakhpur at farmers' field during the year 2001.

Reference

Singh RK, US Singh and GS Khush (2000) *Aromatic Rices*. Science Publishers, Inc. Enfield, USA and Oxford & IBH Publishing Co., New Delhi. 302p.