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RESEARCH ARTICLE

Performance of new ragi variety ML 365 by adopting production technology in southern Karnataka, India

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SUMMARY

A study was conducted in South Eastern Dry Zone (Zone-5) of Karnataka, India to assess the performance of new ragi variety ML-365 vs GPU 28 (check) in rainfed situation. The performance of ML365 was superior in both grain and straw yield over GPU 28 at all the 40 locations. The farmers harvested an average grain yield of 32.24 q/ha with the highest grain yield of 47.20 q/ha and the lowest grain yield 10.00 q/ha with a yield advantage of 11.19 per cent over the existing variety (GPU 28) in all locations. Similarly, farmers harvested an average straw yield of 66.40 q/ha with the highest straw yield of 152.00q/ha and the lowest straw yield 30.00q/ha with a yield advantage of 13.40 per cent over the existing variety (GPU 28) in all 40 locations. The farmers identified important key traits like low dusting ability, superior cooking quality and high nutritive quality of the fodder of ML 365 as compared existing variety. The results revealed that acceptance of ragi variety by farmers mainly depends on key traits like high grain yield with better fodder quality like low dusting during threshing, grain colour and resistance to drought and blast. The research information gives feedback information to ragi breeder to incorporate these traits in breeding of new ragi varieties for rainfed condition.

Key Words **:** ML 365, Ragi, Adoption, Low dusting, Rainfed crop

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Ragi (*Elusina coracona*) is also called finger millet, originally native to the Ethiopian highland and was introduced to India about 4000 years ago. This finger millet is the main staple food consumed by majority of the people in South Karnataka. Ragi is grown as rainfed as well as irrigated crop, mostly cultivated by poor and marginal farmers as it is most nutritious among all the cereals and grown as pure crop as well as intercrop with pulses. Ragi is rich in carbohydrates, calcium, fibre, proteins and vitamins, contains slow releasing carbohydrates and provides continuous energy and is being promoted as food for diabetics.

Ragi is grown in 1.8 million ha with average yield of 1.3 t/ha in India and 9.16 lakh ha area and 14.02 lakh ton of productivity with average yield of 1.6t/ha in Karnataka (http:www.icrisat.org/crop-fingermillet.htm and Anonymous, 2011). The area has declined from 2.6 million ha in early sixties to around 1.8 million ha in 2002-2003.However, the annual production is maintained around 2.6 million tones with a productivity of around 1,400kg/ha (Anonymous, 2011). With existing varieties, the yields are low under rainfed situation due to non-availability of drought tolerant varieties. Incidence of leaf and neck blast also reduces the grain yield and fodder quality significantly.

A new high yielding, drought tolerant and blast resistant variety ML365 was developed by the Department of Genetics and Plant Breeding, University of Agricultural Sciences, Bangalore, India to overcome the above problem. This variety can be raised completely under rainfed situation and can tolerate severe stress for long periods without reduction in grain yields. The variety was developed by crossing Indo-

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African genotypes and developing recombination inbred line using marker assisted selection and farmers participatory evaluation. This variety was formally tested in multilocation trials over three years in dry zone and in farm trials by the Karnataka State Department of Agriculture. ML 365 was formally released by the University in March, 2008 for cultivation in rainfed situation.

ML 365 is high grain yielding (5.0-5.5 t/ha) under rainfed situation, high tillers and high fodder yield (5.5-6.5t/ha), early duration (105 days) with medium height, resistant to blast disease, tolerant to drought, low dusting type during thrushing, sturdy stems and resistant to lodging and breaking during cutting for fodder and good cooking and keeping quality of different recipies like Mudde or Ragi Balls.

With this background, the present study was carried out with the following specific objectives to study the performance of new ragi variety ML 365 in rainfed situation, to estimate the adoption of recommended production technology by ragi growers and to elicit the constrains in adoption of recommended production technology by ragi growers

MATERIALS AND METHODS

The present investigation was carried out in Bangalore Urban, Bangalore Rural, Kolar and Tumkur districts of South Eastern dry zone during 2007-2008, which were purposely selected for the study as considering the maximum area under rainfed situation. A list of villages with maximum number of progressive farmers was prepared with support of Programme Co-ordinator of Krishi Vignan Kendra and Assistant Director of Agriculture of the respective taluks. Forty villages were selected randomly from 16 taluks for the study at the rate of one farmer from each village. Indicators like grain and straw yield were considered to compare the performance of the newly released ML 365 ragi variety. A pre-tested and structured schedule was developed to elicit data from the farmers. Frequency and percentages were worked out for analysis and interpretation of data.

RESULTS AND DISCUSSION

The results of the trials conducted on the farmer's field at different locations in zone-5 are presented in Table 1. The performance of ML 365 was superior in grain yield over GPU 28 at all the 40 locations. Results were elicited district wise and grain yield obtained by growing ML 365 under rainfed situation was satisfactorily compared with existing varieties. The farmers harvested an average grain yield of 34.88 q/ha with the highest grain yield of 42.00 q/ha and the lowest grain yield of 22.50 q/ha with an yield advantage of 12.30 per cent over the existing variety (GPU 28) was recorded in Bangalore Rural district. Similarly, an average grain yield of 25.97 q/ha with the highest grain yield of 47.20 q/ha and the lowest grain yield of 10.00 q/ha with an yield advantage of 10.50 per cent over the existing variety (GPU 28) was recorded in Kolar district. Comparatively an average grain yield of 34.47 q/ha with the highest grain yield of 44.00 q/ha and the lowest grain yield of 16.00 q/ha with an yield advantage of 11.20 per cent over the existing variety (GPU 28) was recorded in Tumkur district. Table 2 and Fig. 1 show superior performance of ML 365 over GPU 28 in respect of grain yield in three districts of Southern dry zone. Results of 40 locations considered for the study, indicated an average grain yield of 32.24 q/ha with on yield advantage of 11.19 per cent over the existing variety GPU 28. Similarly, an average straw yield of 66.40 q/ha with on yield advantage of 13.40 per cent over the existing variety GPU 28. Contributing factors for the higher yield could be the increased number of productive tillers (6 tillers/hill in ML 365 and 4tillers/ hill in check), more number of productive ear head / finger (7 ear head /finger and 5 ear head in the check) and resistant to blast diseases (Zero per cent in ML 365 and 10% in check variety).Considering the yield advantage and favourable feedback from the farmers, UAS, Bangalore has released ML 365 for bulk production among farmers in Karnataka.

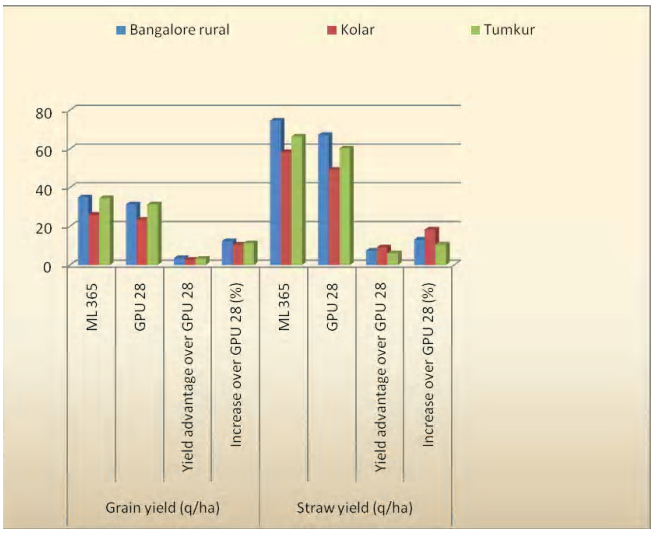

Fig. 1 : Average grain yield of ragi variety ML 365 over GPU 28 in three districts of zone 5 of Karnataka

The results on adoption of recommended production technology by ragi growers were assessed and the same is presented in Table 3. A very large majority (95.00%) of farmers had adopted proper prepatory tillage, recommended seed rate (92.50%) and timely sowing (90.00%). While a large majority (87.50%) of ragi growers found to adopt proper method of application of chemical fertilizers, timely intercultivation (85.00%) and timely weeding (80.00%). Nearly, three fourth (75.00%) of respondents applyied manures as per recommendation and 72.50 per cent of farmers adopted line sowing method. The study indicated that only 30.00 per cent of respondents applied the recommended dose of fertilizers. The

Table 1 : Performance of new ragi variety ML 365 in three districts (South Eastern dry zone of Karnataka) *Kharif*, 2007-2008 for grain and straw yield

Locations	Grain yield (q/ha)				Straw yield (q/ha)			
Bangalore rural	ML 365*	GPU 28**	Yield advantage over GPU28	Increase over GPU28 (%)	ML 365	GPU 28	Yield advantage over GPU28	Increase over GPU28 (%)
1.	35.20	32.88	2.32	7.07	81.00	75.00	6.00	8.00
2.	38.40	38.00	0.40	1.05	82.00	81.00	1.00	1.23
3.	22.50	21.25	1.25	5.88	42.75	36.85	5.90	17.37
4.	36.00	24.00	12.00	50.00	58.75	45.50	13.25	29.12
5.	33.30	32.20	1.10	3.41	152.00	144.00	8.00	5.50
6.	42.00	38.00	4.00	10.52	69.00	52.00	17.00	32.69
7.	38.00	34.00	4.00	11.76	65.00	56.00	9.00	16.07
8.	32.70	29.70	3.00	10.10	64.10	61.00	3.10	5.08
9.	34.50	30.70	3.80	12.37	66.70	60.00	6.70	11.16
10.	36.00	32.00	4.00	12.50	69.00	64.00	5.00	7.81
11.	35.10	31.70	3.40	10.72	70.00	63.30	6.70	10.58
Mean	34.88	31.31	3.57	12.30	74.57	67.15	7.42	13.14
Kolar								
12.	36.90	30.40	6.50	20.96	55.00	45.00	10.00	20.90
13.	47.20	42.40	4.80	11.32	69.38	60.13	9.25	15.38
14.	24.00	20.70	3.30	15.94	80.00	60.00	20.00	33.33
15.	10.00	9.50	0.50	5.26	30.00	25.00	5.00	20.00
16.	22.00	21.00	1.00	4.76	32.00	29.00	3.00	10.34
17.	23.70	20.00	3.70	18.50	65.00	52.00	13.00	25.00
18.	15.60	14.50	1.10	6.12	88.00	80.00	8.00	10.00
19.	26.00	24.00	2.00	8.33	56.20	48.00	8.20	17.08
20.	28.00	26.00	2.00	7.66	57.00	49.00	8.00	16.32
21.	26.00	24.00	2.00	8.33	56.50	47.50	9.00	18.94
22.	26.00	24.00	2.00	8.33	52.00	45.50	6.50	14.28
Mean	25.95	23.32	2.63	10.50	58.28	49.19	9.09	18.32
Tumkur								
23.	16.00	16.80	-0.80	-4.36	65.00	66.50	-1.50	-2.25
24.	16.60	15.20	1.40	10.02	70.00	64.80	5.20	8.02
25.	24.00	21.60	2.40	9.76	60.00	56.00	4.00	7.11
26.	39.33	35.00	4.33	12.35	69.75	61.88	7.87	12.02
27.	36.00	33.38	2.62	7.86	65.50	59.50	6.00	10.08
28.	38.00	40.00	-2.00	-5.00	71.50	72.50	-1.00	-1.37
29.	35.00	30.00	5.00	16.6	64.25	55.00	9.25	16.81
30.	38.35	33.40	4.95	14.82	67.75	58.75	9.00	17.39
31.	38.35	35.00	3.35	9.57	70.38	65.00	5.38	8.26
32.	40.00	36.65	3.35	9.14	71.75	65.50	6.25	9.54
33.	35.00	30.00	5.00	16.66	63.50	56.25	7.25	12.89
34.	33.25	30.00	3.25	1.83	60.00	54.50	5.50	12.14
35.	33.30	30.00	3.30	11.00	60.20	53.00	7.20	13.20
36.	44.00	40.00	4	10.00	74.50	66.00	8.50	12.87
37.	40.00	36.65	3.35	9.14	68.00	58.25	9.75	15.74
38.	40.00	36.65	3.35	9.14	67.00	60.25	6.75	11.20
39.	40.00	35.00	5.00	14.28	68.00	60.50	7.50	12.39
40.	33.30	28.50	4.80	14.00	57.50	50.50	7.00	13.86
Mean	34.47	31.32	3.15	11.20	66.37	60.26	6.11	10.55
Avg of 40 location	32.24	29.12	2.92	11.19	66.40	59.11	7.29	13.40

*New ragi variety **Check variety

Table 2 : Average grain and straw yield of new ragi variety ML 365 over GPU 28 in three districts of zone 5 of Karnataka

Locations	Grain yield (q/ha)				Straw yield (q/ha)			
	ML 365	GPU 28	Yield advantage over GPU 28	Increase over GPU 28 (%)	ML 365	GPU 28	Yield advantage over GPU 28	Increase over GPU 28 (%)
Bangalore rural	34.88	31.31	3.57	12.30	74.57	67.15	7.42	13.14
Kolar	25.95	23.32	2.63	10.50	58.28	49.19	9.09	18.32
Tumkur	34.47	31.32	3.15	11.20	66.37	60.26	6.11	10.55

Table 3 : Adoption of recommended production technology by ragi growers in rainfed situation

Production technologies	Adoption	
	Frequency	Per cent
1.Preparatory tillage		
a. Proper	38	95.00
b. Improper	02	05.00
2.Use of manures (8tons/ha)		
a. As per recommendation	30	75.00
b. Less than recommendation	09	22.50
c. Not used	01	02.25
3. Seed rate (12kg/ha)		
a. As per recommendation	37	92.50
b. Less than recommendation	03	7.50
4.Seed treatment (2g cabendezium/kg)		
a. Used	03	7.50
c. Not used	37	92.50
5.Time of sowing (June to August)		
a. Timely sowing	36	90.00
b. Untimely sowing	04	10.00
6..Method of sowing		
a. Line sowing	29	72.50
b. Broadcasting	11	27.50
7.Use of chemical fertilizers (50:40:25,NPK/ha)		
a. As per recommendation	12	30.00
b. Less than recommendation	05	12.50
b. More than recommendation	23	57.50
8. Application of chemical fertilizers		
a. Timely sowing	35	87.50
b. Untimely sowing	05	12.50
9.Use of micronutrients (zinc sulphate,20kg/ha)		
a. Used	06	15.00
b. Not used	34	85.00
10. Weeding		
a. Timely	32	80.00
b. Untimely	08	20.00
11. Intercultivation		
a. Timely	34	85.00
b. Untimely	06	15.00

Table 4 : Preferred key traits for acceptance of new ragi variety, ML 365		n=40	
Sr. No.	Key traits	Frequency	Per cent
1.	Low dusting during threshing	37	92.50
2.	Grain colour	35	87.50
3.	Superior cooking and keeping quality	40	100.00
4.	High grain yield with better fodder quality	35	87.50
5.	Resistance to drought and blast	40	100.00
6.	High tillers and more number of ear heads	32	80.00
7.	Resistant to lodging and breaking during cutting fodder	36	90.00

Table 5:- Constraints in adoption of recommended production technology by ragi growers in rainfed situation			n=40
racteristics	Adoption		Mean value of percentage
	Frequency	Per cent	
1. Erratic / Scattered rainfall	36	90.00	90.00
2. High wages of labours	40	100.00	100.00
5. Non-availability of labour	28	70.00	
a. For sowing	37	92.50	78.75
b. Weeding and intercultivation	29	72.50	
c. For harvesting and threshing	32	80.00	

data also revealed that very negligible (15.00%) number of ragi growers applied micronutrients and adopted seed treatment (6.00%), similar results were also reported by Ban *et al.* (2010).

The data in Table 4 indicate that, cent per cent of ragi growers expressed key traits like superior cooking and keeping quality, resistance to drought and blast disease. A great majority of respondents have observed key traits like low dusting during threshing (92.50%) and resistant to lodging and breaking while cutting fodder (90.00%). Majority of ragi growers expressed key traits like attractive grain colour (87.50%), high grain yield with better fodder quality (87.50%) and high tillers and more number of ear heads (80.00%).

The data with respect to the constraints experienced by the ragi growers in adoption of recommended production technology practices have been furnished in Table 5. It could be noticed that all the growers of ragi expressed that the high labour wages followed by erratic/ scattered rainfall (90.00%), non-availability of labours for manual weeding (92.50%), harvesting (80.00%), intercultivation (72.50%) and sowing (70.00%) as major constraints. The present findings in are conformity with the findings of Shivalingaiah Nagabhushanam (2010).

Adoption of production technology among ragi growers, were found with respect to preparatory tillage, recommended seed rate, timely sowing, application of chemical fertilizer, timely inter cultivation and timely weeding. The major constraints experienced high wages of labours, erratic/ scattered rainfall and non-availability of labours during critical agronomical operations.

Based on the findings of the study, it is concluded that the new ragi variety ML-365 performed superior to the existing check variety GPU- 28 at all the locations. Hence, this variety is likely to spread among farmers. Considering the superior performance of this variety in terms of improving productivity, low dusting, resistance to drought and blast, the immediate need requires popularizing ML- 365 among farmers in Southern Karnataka. It is suggested that conducting large scale demonstrations, ensuring availability of seed material and other inputs required for adoption of important agronomical practices plays a major role in enhancing ragi production. The results of the study implies that the scientists/ breeders while developing a new variety has to consider the important traits liked by the consumers as well as farmers. ML- 365 variety developed by the Department of Genetics and Plant Breeding in University of Agriculture Science, Bangalore has many good traits.

Hence, it has been adopted by the majority of the farmers.

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