

# Efficiency of mechanical thresher over traditional method of threshing finger millet

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■ **ABSTRACT** : The research was conducted on efficiency of mechanical thresher over traditional method of threshing finger millet. Finger millet (*Eleusine Coracana* Craertn) commonly known as ragi is one of the important small millet crop grown in red soil areas of India. It is predominantly cultivated in southern parts of Karnataka. The process of seed damage starts right from harvest to storage. The traditional methods of threshing are tedious time consuming and inefficient in operation. The experiment was conducted with two ragi varieties (MR1 and HR911). Hence, mechanical threshing is a means to overcome the above problems. So as to evaluate the performance efficiency of mechanical thresher over traditional method of threshing finger millet and optimum threshing parameters for finger millet. Some of the important parameters which influence the threshing efficiency, mechanical damage, moisture content, threshing cylinder speed, feeding rate and concave clearance. The method of threshing was experimented at three different moisture content levels of ragi [around 18 to 19, 13 to 15 and 10% (w.b.)]. The mechanical ragi thresher has given the maximum grains output of 140.5 kg/h for variety MR1 and 130.3 kg/h for variety HR911 as compared to traditional threshing methods.

■ **KEY WORDS** : Finger millet, Rasp bar thresher, Stone roller, Moisture content, Ragi varieties

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**F**inger millet (*Eleusine Coracana* Craertn) commonly known as ragi is one of the important small millet crops grown in red soil areas of India. It is predominantly cultivated in southern parts of Karnataka. The crop occupies an area of 2.5 million hectares and contributes 2.6 million tonnes of grain in India. The average yield of the crop under rainfed conditions is about 10 quintals per hectare and under irrigated conditions its about 25 quintals per hectare. Its cultivation is concentrated mainly in the states of Karnataka (49%), Orissa (11%), Maharashtra (10%), Tamil Nadu (9%) and Andhrapradesh (7%), Karnataka stands first both in area (1.06 million ha) and production (1.5 million tonnes). Among all states, Karnataka contributes 54 per cent to country's annual production.

Moisture content of the ear-head plays a key role in threshing operation and seed quality. The traditional methods of threshing are tedious time consuming and inefficient in operation. Hence, mechanical threshing is a means to overcome the above problems. At present there is a little information available regarding the mechanical threshers and optimum

threshing parameters for ragi crop.

Hence, the present investigation entitled efficiency of mechanical thresher over traditional method of threshing finger millet (*Eleusine Coracana* Craertn) was undertaken at the University of Agricultural Sciences, Gandhi Krishi Vignana Kendra, Bangalore with the following objectives:

-To evaluate the threshing of finger millet by traditional and mechanical methods, to study the effect of different parameters on threshing output and efficiency in ragi threshing and to determine the optimum operating parameters to obtain maximum threshing output and efficiency.

## ■ METHODOLOGY

This chapter deals with the materials used and the methods employed in the experiment on evaluation and testing of threshing methods for ragi threshing with respect to grain moisture content output, threshing efficiency, damage, germination percentage and cost of threshing conditions.

The experiment was conducted with the varieties of ragi

MR1 and HR911, the threshing methods were adopted at three different moisture content levels of ragi [around 18 to 19, 13 to 15 and 10% (w.b.)] and the types of traditional threshing methods and raspbar type thresher were adopted.

### Experimental details :

#### Treatment details:

Threshing by traditional methods (T) :

T<sub>1</sub> = Manual beating with stick

T<sub>2</sub> = Bullock drawn stone roller

T<sub>3</sub> = Tractor drawn stone roller

#### Ragi varieties :

V<sub>1</sub> = MR1

V<sub>2</sub> = HR911

#### Moisture content of grain (M) :

M<sub>1</sub> = 18 to 19%

M<sub>2</sub> = 13 to 15%

M<sub>3</sub> = 9 to 10%

### Threshing by rasp bar type thresher :

The efficiency of threshing, different effective concave clearances and threshing drum speeds were recorded at different machine parameter combinations *viz.*, two threshing drum speeds of 800 and 1000 rpm and three concave clearance of 4, 7 and 10mm were evaluated for the best threshing results.

The following observations were recorded and parameters computed during the studies.

### Parameters recorded :

- Speed of the threshing cylinder (rpm)
- Weight of the crop fed into the thresher (kg)

- Weight of the threshed grain (kg/h)
- Weight of the unthreshed grains (kg/h)
- Weight of the damaged grains (kg)
- Seed moisture content (%)
- Blower air velocity (m/s)
- Concave clearance (mm)

## RESULTS AND DISCUSSION

The experimental findings obtained from the present study have been discussed in following heads:

### Evaluation studies of traditional threshing methods :

#### Effect of grain moisture content on threshing output of threshed grain :

The observations on the output of grain of threshed ragi as influenced by different levels of grain moisture content in different traditional methods are presented in Table 1. The output of threshed grain in manual beating with a stick at grain moisture content of 18.20 per cent for variety MR1 was 4.9kg/h and at 9.80 per cent grain moisture content it was increased to 7.4 kg/h. Similarly for variety HR911 at grain moisture content of 18.9 per cent the grain output of threshed grain was 3.8 kg/h and it increased to 6.0 kg/h when the grain moisture content decreased to 10 per cent.

In case of threshing by bullock drawn stone roller for variety MR1, the maximum grain output was 28.65 kg/h at 15.2 per cent moisture content and at 9.80 per cent moisture content the output was 22.9 kg/h. But for HR911 the maximum output was 25.1 kg/h at 13.4 per cent moisture content and 22.01 kg/h of threshed grain was observed at 18.9 per cent grain moisture content.

In threshing by a tractor drawn stone roller, the maximum output of threshed grain was observed at 18.20 per cent grain moisture content was 60.9 kg/h and minimum output of

**Table 1: Effect of moisture content level of grain on output of threshed ragi (kg/h) for different threshing methods (including winnowing time)**

Threshing methods	Output of threshed grain (kg/h)							
	Variety MR1				Variety HR911			
	Moisture content				Moisture content			
	18.20%	15.20%	9.80%	Mean	18.9%	13.4%	10.1%	Mean
Manual beating with stick	4.99	6.56	7.48	6.34	3.81	5.22	6.00	5.00
Bullock drawn stone roller	25.07	28.65	22.91	25.54	22.01	25.14	22.58	23.24
Tractor drawn stone roller	60.93	50.63	56.42	55.99	55.98	47.63	50.63	51.41

**Table 2 : Effect of moisture content level of grain on threshing efficiency for different threshing methods**

Threshing methods	Threshing efficiency (%)							
	Variety MR1				Variety HR911			
	Moisture content				Moisture content			
	18.20%	15.2%	9.80%	Mean	18.9%	13.4%	10.1%	Mean
Manual beating with stick	100	100	100	100	100	100	100	100
Bullock drawn stone roller	64.92	71.00	73.10	69.60	67.80	71.40	67.60	68.90
Tractor drawn stone roller	82.30	87.40	91.30	87.00	77.40	83.10	86.90	82.50

threshed grain at 15.2 per cent was 50.63 kg/h for variety MR1. For variety HR 911, the maximum output of threshed grain at 18.9 per cent grain moisture content was 55.98 kg/h and 47.63 kg/h at 13.4 per cent grain moisture content.

#### Effect of grain moisture content on threshing efficiency for different threshing methods :

The observations on the threshing efficiency of ragi is influenced by different levels of grain moisture content of 18.20, 15.20 and 9.80 for variety MR1 and 18.9, 13.4 and 10.1 per cent for variety HR911 are presented in Table 2.

The tractor drawn stone roller recorded maximum threshing efficiency of 91.3 per cent at 9.80 per cent moisture

content for variety MR1 and 86.9 per cent at 10.1 per cent grain moisture content for variety HR911. The lowest threshing efficiency was observed at 18.2 and 10.1 per cent grain moisture content is 64.92 per cent and 67.6 per cent, respectively for variety MR1 and HR911. From the threshing efficiency results, it was observed that the grain moisture content played an important role as the grain moisture content of grain decreased.

#### Evaluation studies of raspbar type thresher :

The observations on the crop feed rate of raspbar type thresher as influenced by different threshing drum speed (960 and 1200 rpm) and concave clearance 5, 7 and 10 mm were presented.

**Table 3 : Threshing efficiency (%) of the raspbar type thresher for MR1 ragi variety at different drum speed, concave clearance and moisture content**

Concave Clearance (mm)	Threshing efficiency (%)							
	Drum speed 960 rpm				Drum speed 1200 rpm			
	Moisture content			Mean	Moisture content			Mean
18.20%	15.20%	9.8%	18.20%		15.20%	9.8%		
5mm	68.97	72.39	78.38	73.25	71.63	73.37	79.63	74.88
7mm	67.83	71.77	75.06	71.35	68.27	72.17	78.22	72.89
11 mm	63.20	69.66	71.93	68.26	64.91	69.83	72.30	69.01

**Table 4: Threshing efficiency (%) of the raspbar type thresher for HR911 ragi variety at different drum speed, concave clearance and moisture content**

Concave Clearance (mm)	Threshing efficiency (%)							
	Drum speed 960 rpm				Drum speed 1200 rpm			
	Moisture content			Mean	Moisture content			Mean
18.90%	13.40%	10.10%	18.90%		13.40%	10.10%		
5mm	66.13	70.95	75.47	70.85	67.76	72.86	76.38	72.40
7mm	64.34	69.71	74.89	69.65	64.04	71.91	74.84	70.26
11mm	63.20	66.24	67.75	65.73	63.95	66.71	68.80	66.49

**Table 5: Threshed grain output (kg/h) of the raspbar type thresher for MR1 ragi variety at different drum speed, concave clearance and moisture content**

Concave Clearance (mm)	Output of threshed ragi grain (kg/h)							
	Drum speed 960 rpm				Drum speed 1200 rpm			
	Moisture content			Mean	Moisture content			Mean
18.2%	15.2%	9.8%	18.2%		15.2%	9.8%		
5mm	92.2	99.4	124.1	105.2	110.9	118.4	140.0	123.1
7mm	107.8	103.8	112.0	107.8	101.1	109.6	122.4	111.0
11mm	94.6	100.8	115.6	103.6	99.9	102.1	118.0	106.6

**Table 6 : Threshed grain output (kg/h) of the raspbar type thresher for HR911 ragi variety at different drum speed, concave clearance and moisture content**

Concave Clearance (mm)	Output of threshed ragi grain (kg/h)							
	Drum speed 960 rpm				Drum speed 1200 rpm			
	Moisture content			Mean	Moisture content			Mean
18.9%	13.4%	10.1%	18.9%		13.4%	10.1%		
5mm	102.2	96.4	114.1	104.2	106.9	98.4	130.3	111.8
7mm	92.8	97.8	100.0	96.8	98.1	107.6	122.4	109.3
11mm	91.6	102.8	117.6	104.0	94.3	102.1	114.0	103.4

### Effect of concave clearance, threshing drum speed and moisture content of the grain on threshing efficiency :

The observations on threshing efficiency for ragi varieties MR1 and HR911 when subjected to threshing in raspbar type thresher at different concave clearances, threshing drum speeds and grain moisture content levels are presented in Table 3 and 4, respectively. The threshing efficiency due to interaction effect between concave clearances, threshing drum speeds and grain moisture content levels did not differ significantly.

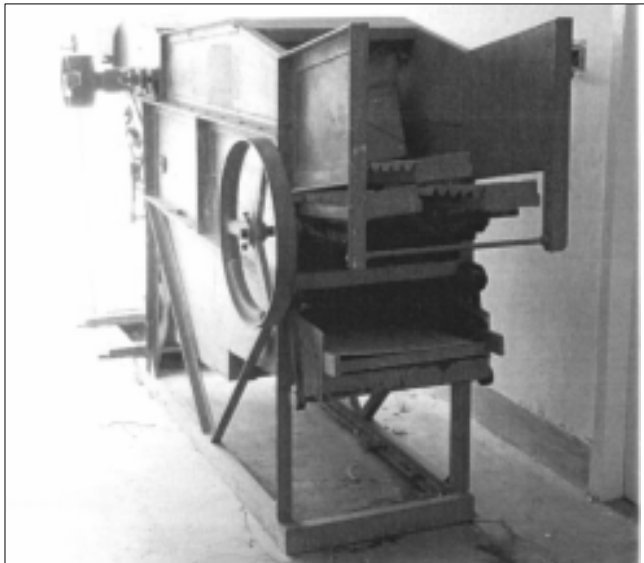


Fig. 1: Power and tractor operated ragi thresher

#### Variety MR1 :

The threshing efficiency at threshing drum speed of 960 rpm and 1200 rpm, concave clearance of 5, 7 and 11 mm and grain moisture content of 18.20, 15.20 and 9.8 per cent are presented in the Table 3 .

The highest threshing efficiency of 79.3 per cent was obtained at combination of 5mm concave clearance, 1200 rpm

threshing drum speed and grain moisture content of 9.8 per cent. And the lowest threshing efficiency of 63.20 per cent was obtained at combination of 11mm concave clearance 960 rpm threshing drum speed and grain moisture content of 18.20 per cent .

#### Variety HR911 :

The highest threshing efficiency of 76.38 per cent was obtained at combination of 5mm concave clearance, 1200 rpm threshing drum speed and grain moisture content of 10.1 per cent. And similarly the lowest threshing efficiency of 63.2 was recorded at combination of 11 mm concave clearance, 960 rpm threshing drum speed and grain moisture content of 18.90 per cent, respectively.

#### Conclusion :

- In threshing methods, the mechanical raspbar thresher has given the maximum grains output of 140.5 kg/h for variety MR1 and 130.3 kg/h for variety for HR911 as compare to traditional methods for ragi threshing.
- In case of raspbar type thresher the maximum threshing efficiency of 79.6 and 76.3 per cent was observed for varieties MR1 and HR911, respectively. The threshing efficiency increased with decrease in moisture content and increase in threshing drum speed.
- The output of the threshed grain, threshing efficiency are more in case of mechanical thresher but intial cost was much higher as compared to traditional methods and threshing of ragi crop at 10 to 13 per cent grain moisture content is recommended for adoption and less labours required for operation.

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