

1 **PERFORMANCE EVALUATION OF TRACTOR OPERATED**
2 **GROUNDNUT THRESHER**

3
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23 **1. Abstract**

24 The production of groundnut in India is being rapidly increased in the last ten
25 years and is expected to increase further in coming decade. Farmer mostly used
26 traditional cultivation practices for production of groundnut, which are labour and
27 time intensive. Therefore, time saving machineries suited to labours should be used by
28 growers to handle harvest and post-harvest operations for this crop. The performance
29 evaluation of the thresher for groundnut crop was conducted with 50 hp tractor. The
30 experiment was carried out at the Cotton Research Centre and Instructional Farm of
31 College of Agricultural Engineering and Technology, Junagadh Agricultural
32 University, Junagadh for kharif groundnut for Virginia Bunch type varieties of GG-20
33 and GG-22, respectively. The pod output capacity was observed as 524.66 kg/h
34 (cylinder speed ~ 292 rpm) and 407.60 kg/h (cylinder speed ~ 421 rpm) for GG-22

35 and GG-20 varieties, respectively. The percentage of blown pods, un threshed pods,
 36 broken pods and spilled pods were observed as 14.51, 18.92, 0.126, 1.04 % and 6.07,
 37 14.59, 0.361, 0.99 % for GG-22 and GG-20 varieties, respectively. The average
 38 threshing and cleaning efficiency were found as 81.08, 88.21 and 85.41, 88.74 % for
 39 GG-22 and GG-20 varieties, respectively. The overall average cost of threshing
 40 operation was observed Rs.729.42 per hour and Rs.156 per quintal for both the
 41 varieties.

42 **Keywords:** Tractor, Thresher, Performance, Evaluation, Threshing efficiency,
 43 Cleaning efficiency, Groundnut.

44 2. INTRODUCTION

45
 46 The peanut, also known as the groundnut and taxonomically classified as
 47 *Arachis hypogaea*, is a legume crop grown mainly for its edible seeds, and they are
 48 high in protein, oil and fiber. This plant is native to South America. The botanical
 49 name of groundnut, *Arachis hypogaea*, is derived from two Greek words, *Arachis*
 50 meaning a legume and *hypogaea* meaning below ground, referring to the formation of
 51 pods in the soil. Peanut or groundnut is a self-pollinating, indeterminate, annual
 52 herbaceous legume crop (Burns, 2010). It is also known as earth nut, peanut or
 53 monkey-nut. It is commonly called the poor man's nut. Peanut mostly grown due to its
 54 oil, protein and carbohydrates (Abdzad Gohari et al, 2010).The oil of peanut is one of
 55 the most important vegetable oil in regions where other oily vegetables cannot grow
 56 up (Hosseinzadeh Gashti et al., 2012). Peanut has several uses as whole seeds or is
 57 processed to make peanut butter, oil, and other products (Putnam et al., 2013). Peanut
 58 is one of the most important oilseed plants in the world. Its seeds contain 40 - 50%
 59 fat, 20 - 50% protein and 10 - 20% carbohydrate depending on the variety (Okello et
 60 al., 2010).

61 Groundnut is grown on nearly 24.73 million hectares in world with annual
 62 production of 403.70 lakh tons of nuts-in-shells and the productivity is 1630 kg/ha. It
 63 is grown on large scale in India, China, USA, Senegal, Indonesia, Nigeria, Brazil and
 64 Argentina. The total area under groundnut cultivation in India is 4.56 million hectares,
 65 which accounts for the total production of 67.71 lakh tons with the productivity of
 66 1486 kg/ha (Anonymous, 2016). Country wise groundnut production for the year
 67 2015- 2016 is shown in Table 1.

68 **Table 1: Area, Production and Yield of Groundnut Major Countries**

Sr. No.	Country	Area (Lakh ha)		Production (Lakh tons)		Yield (Kg/ha)	
		2014-15	2015-16	2014-15	2015-16	2014-15	2015-16
1	China	46.00	46.00	164.80	165.00	3580	3590
2	India	47.69	45.55	74.02	67.71	1552	1486

3	Nigeria	27.70	25.00	34.10	30.00	1230	1200
4	USA	5.40	6.30	23.50	27.20	4400	4310
5	Sudan	12.50	21.80	9.60	18.70	770	860
6	Myanmar	8.90	8.90	13.80	13.80	1550	1550
7	Indonesia	6.30	6.20	11.50	11.30	1830	1840
8	Senegal	8.80	11.40	6.70	10.70	760	940
9	Niger	7.80	7.40	4.00	3.50	520	470
10	Cameroon	4.70	4.00	6.40	5.50	1360	1380
	Others	64.71	64.75	49.98	50.29	772	777
	World	240.50	247.30	398.40	403.70	1660	1630

69 (Status paper on groundnut, 2017)

70

71 **Table 2: State Wise Area, Production and Yield of Groundnut**

Sr. No.	States	Area (Lakh ha)			Production (Lakh tons)			Yield (Kg/ha)		
		2013-14	2014-15	2015-16	2013-14	2014-15	2015-16	2013-14	2014-15	2015-16
1	Gujarat	18.40	14.00	14.14	49.20	22.20	23.58	2668	1586	1668
2	AP	13.90	10.30	7.75	12.40	7.90	8.02	892	771	1035
3	Rajasthan	4.60	5.00	5.21	9.00	10.20	10.56	1992	2024	2028
4	Tamil Nadu	3.40	3.40	3.52	9.20	9.00	8.82	2723	2699	2509
5	Karnataka	6.60	6.50	5.91	5.70	5.60	4.85	863	870	821
6	MP	2.10	2.30	2.36	3.20	3.70	3.50	1573	1602	1483
7	Maharashtra	3.20	2.40	2.40	3.90	2.50	2.37	1248	1063	988
8	Telangana	-	-	1.27	-	-	2.06	-	-	1622
9	West Bengal	0.78	0.79	0.84	2.02	2.00	2.00	2573	2544	2372
	Others	2.12	2.11	2.15	2.48	2.50	1.95	1308	1639	907
	All India	55.10	46.80	45.55	97.10	65.60	67.71	1764	1400	1486

72 (Status paper on groundnut, 2016)

73 **Table 3 1: District Wise Groundnut Production in Gujarat State (2015-16)**

Sr. No.	District	Area ('00ha)	Production ('000tonnes)	Yield (kg/ha)
1	Rajkot	2731	273	1680
2	Junagadh	2538	253	2052
3	Dwarka	1763	176	1627
4	Amreli	1419	142	2200
5	Jamnagar	1316	132	1856
6	Gir-somnath	1196	120	2413
7	Banaskantha	1166	117	1898

8	Bhavnagar	1093	109	1758
9	Kutch	447	45	2234

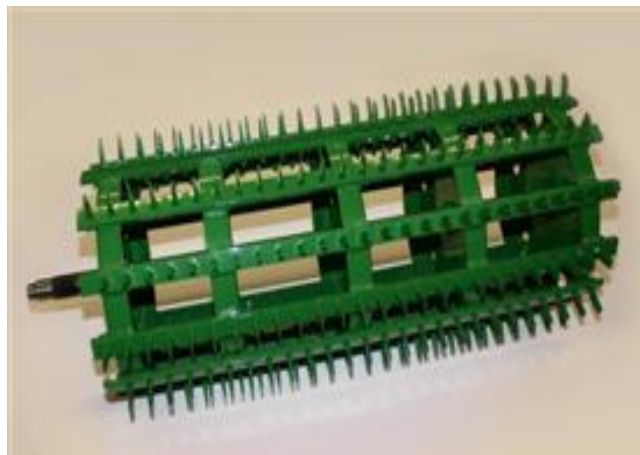
74 (SEA Kharif Groundnut Crop Survey 2015-16)

75 More than 150 varieties of groundnut have been released by AICRP for
76 different agro-ecological situations of India, however only a few age old varieties like
77 TMV-2, TMV-7, GG-11, Chitra Kaushal, SV-xi, JL-24 and AK-12-24, K-6, CO-2,
78 Polachi-1, GAUG-10, and new varieties like TG37-A, GBPD-4, Narayani, ICGV-
79 91114, TPG-41, TG-38, VRI-6 are popular among the farmers for large scale
80 cultivation.

81 The spreading, semi spreading and bunch types groundnut varieties are grown in
82 Gujarat. The spreading varieties like GAUG-10, GG-11, GG-13 etc. and GG-20 is
83 semi-spreading while bunch type varieties of groundnut like JL-24, GG-2, GG-4, GG-
84 7 etc. have been recommended and adopted by the farmers for cultivation in
85 Saurashtra region. The groundnut is sown at the row spacing of 45 cm and 60 cm for
86 bunch type and spreading type, respectivel

87 3. MATERIALS AND METHODS

88 A Groundnut Thresher which is Spike tooth type threshing cylinder type was
89 taken for the study. In fact it is a modification of the drummy type. It is provided with
90 an aspirator blower at the main grain outlet for final cleaning. Sieve assembly is also
91 provided beneath the concave, driven by a crankshaft pulley, which gets its power
92 from the cylinder shaft. The working principle of a Spike tooth type threshing
93 cylinder drum.



94

95

Fig. 1: Spike tooth type threshing cylinder



Fig. 2: Groundnut thresher

Table 3.2: Specification of Groundnut Thresher

A. General

1	Name	Groundnut thresher (square, box type tractor operated)
2	Make	Geeta works
3	Model	B
4	Type	Tangential flow
5	Year of manufacture	2015

B. Power unit

2	Type of prime mover	Tractor operated
3	Recommended power	35hp and above
4	Type of drive	PTO

C. Main drive

1	Type	Belt pulley
2	Size of belt, mm	2580
3	Diameter of pulley, mm	203

D. Threshing system

1. Cylinder

1	Type	Beater
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2	Constructional feature	It is fabricated from circular CI flanges locked on the cylinder shaft at spacing. MS flat beater (perpendicular to the axis of cylinder) are welded on MS angle (3 nos.) fitted parallel to the axis of cylinder of which are bolted to each flanges with nut bolts.
3	Diameter, mm	540
4	Width, mm	825
5	No.& type of bearings	2 pillow block bearing
6	No. & size of beaters/projections/bars	7 (4+3 fitted perpendicular to each other, on each MS angle (3 nos.), blade edge)
7	Spacing between beaters, mm	230
8	No. of flanges	2

106

2. Concave

1	Type	Semi-circular, open
2	Effective width, mm	650
3	Effective length, mm	830
4	Effective area, m^2	0.5395
4	Concave clearance range, mm	15-30
5	Concave clearance, mm	20
6	Method of clearance adjustment	By raising and lowering the concave
7	Constructional feature	It is fabricated from longitudinal MS flats at spacing and semi-circular MS rods are inserted with MS pipes spacer across the longitudinal flats to maintain spacing
8	Concavity, mm	265
9	Nos. and spacing of cross bars, mm	4, 245
8	Method of fixing	It is mounted on two curved angle iron of size bolted by 2 nut bolts

107

E. Sieve

Sr. No.	Parameters	Upper sieve	Lower sieve
1	Type	Punched elliptical holes	Punched elliptical holes
2	Material and size	GI sheet, 0.79 mm	GI sheet, 0.79 mm
3	Size of holes, mm	32.09x2.07(F), 49.17x19.19(R)	56.43x7.77(F), 113.32x8.64(M), 49.38x19.14(R)
4	Density of holes in 100 cm^2	36(F), 3(R)	5(F), 5(M), 3(R)
5	Size of sieve, mm	1445x760	1510x750
6	Effective size, mm	685x150(F), 710x420(R)	695x525(F), 695x225(M), 695x560(R)
7	Effective area, cm^2	1027 (F), 2982(R)	3478(F), 1563(M), 3892(R)
8	Sieve slope, degree	5	10

108

F. Shaking Mechanism

1	Pitman shaft	
	Material	MS rod
	Size , mm	655x38.0 ϕ
	No and types of bearings on pitman shaft	2

	Provision for lubrication	One grease nipple is provided on each bearing cover.
2	Hangers	
	Numbers	4
	Length of angles, mm	
	Total	200(F), 240(R)
	Center to center	145(F), 190(R)
	Stroke length, mm	55
	Nos. and type of bearing on each hanger	2, Ball bearing

109 **G. Blower**

1	Number	1
2	Type	Suction type
3	No. of blade	4
4	Size of blade, mm	730 x 175 x 0.80
5	Diameter, mm	700
6	Provision for changing air displacement	Suction windows are provided
7	Nos. , location and size of window, mm	2, LHS-RHS, 400 ϕ
8	Nos. and type of bearings	2, Pillow block bearing

110 **H. Crop feeding**

1	Type	Hopper
2	Method of feeding	Manual
3	Size of feeding hopper, mm	815 x 325
4	Height of hopper form platform, mm	870
5	Height of feeding hopper from ground level, mm	2300

111 **I. Transport**

1	Type	Tractor mounted
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112 **J. Overall Dimensions**

1	Length, mm	2770
2	Width, mm	1360
3	Height, mm	2120
4	Ground clearance, mm	430
5	Total mass, kg	1160

113 **K. Main pod/ grain outlet**

1	Size, mm	225x100
2	Inclination, degree	5
3	Height of outlet from ground level, mm	535

114 **L. Foreign material outlet**

115 **1. For stones/soil clods**

1	Size, mm	205x115
2	Inclination, degree	5
3	Height of outlet from ground level, mm	515

116 **1. For soil powder**

1	Size, mm	100x40
2	Inclination, degree	Vertical
3	Height of outlet from ground level, mm	825

117

3. Sieve overflow outlet

1	Size, mm	250x35
2	Inclination, degree	5
3	Height of outlet from ground level, mm	535

118

4. Straw outlet

1	Size, mm	845x390
2	Inclination, degree	40-75
3	Height of outlet from ground level, mm	985

119

120 4. RESULTS AND DISCUSSION

121 Experimental data collected during the course investigation. It is also
122 including the evaluation of the various crop parameters like moisture content of pods
123 and vine, pod-vine ratio. It also includes various performance parameter like crop feed
124 rate, pod output capacity, percentage of blown pods, percentage of un threshed pods,
125 percentage of broken pods, percentage of spilled pods, threshing efficiency and
126 cleaning efficiency.

127 4.1 Field Testing and Evaluation

128 Performance of groundnut thresher was evaluated at Cotton research Centre
129 and Instructional Farm of College of Agricultural Engineering & Technology, JAU,
130 Junagadh for the varieties of GG-22 and GG-20, respectively.

131 4.2 Crop Parameters

132 The crop parameters such as crop variety and pod-vine ratio were determined
133 during the study.

134 4.2.1 Type of crop and variety

135 The experiment was conducted on groundnut of GG-22 and GG-20 varieties.
136 Both are Virginia Bunch type groundnut which are semi-spreading type.

137 4.2.2 Pod-vine ratio

138 Pod-vine ratio was determined by taking crop samples. The pods and plant
139 matters (vine) were separated and it was observed as 0.3354 and 0.5836 for varieties
140 GG-22 and GG-20 respectively.

141 4.3 Field Observations

142 Field observations such as moisture content, crop feed rate, fuel consumption
143 and labour requirement were determined during the study.

144 4.3.1 Crop moisture content

145 The moisture content of pods and vine were measured by the oven drying
 146 method as shown in Appendix-III. It was found that moisture contents of pods are
 147 11.73 % (d.b.) and 6.81 % (d.b.) for varieties GG-22 and GG-20, respectively. The
 148 moisture contents of vine are 11.53 % (d.b.) and 12.92 % (d.b.) for GG-22 and GG-20
 149 varieties respectively.

150 4.3.2 Crop feed rate

151 Crop feed rate was measured as per standard method. Test results indicated
 152 that at threshing cylinder speed of 292 rpm and 421 rpm, the crop feed rate was varied
 153 from 2033.89 to 2117.65 and 1282.05 to 1333.33 for GG-22 and GG-20 varieties,
 154 respectively.

155 4.3.3 Fuel consumption

156 The hourly fuel consumption in case of threshing was 2.46 lit/hr and 2.14 lit/hr
 157 for the varieties GG-22 and GG-20, respectively. Both tests were carried out by 50hp
 158 tractor.

159 4.3.4 Labour requirement

160 Six labours were required during the threshing of groundnut crop. One labour
 161 was required for feeding of crop, one labour was required for straw handling, one
 162 labour was required for pod handling and others were required for crop handling.

163 4.4 Determination of Threshing Parameters

164 The threshing parameters such as crop feed rate, pod output capacity,
 165 percentage of blown pods, percentage of un threshed pods, percentage of broken pods,
 166 percentage of spilled pods, threshing efficiency and cleaning efficiency were
 167 determined during the study.

168 **Table-4.1 Determination of Threshing Parameters**

Avg. crop feed rate kg/ha		Avg. pod output capacity		percentag e of blown pods		percentag e of unthreshed pods		percentag e of broken pods		percentag e of spilled pods		threshing efficiency		cleaning efficiency	
GG-20	GG-22	GG-20	GG-22	GG-20	GG-22	GG-20	GG-22	GG-20	GG-22	GG-20	GG-22	GG-20	GG-22	GG-20	GG-22
1304.36	2115.55	407.60	524.66	6.071	14.59	14.52	18.92	0.361	0.126	0.99	1.04	85.41	81.08	88.74	88.21

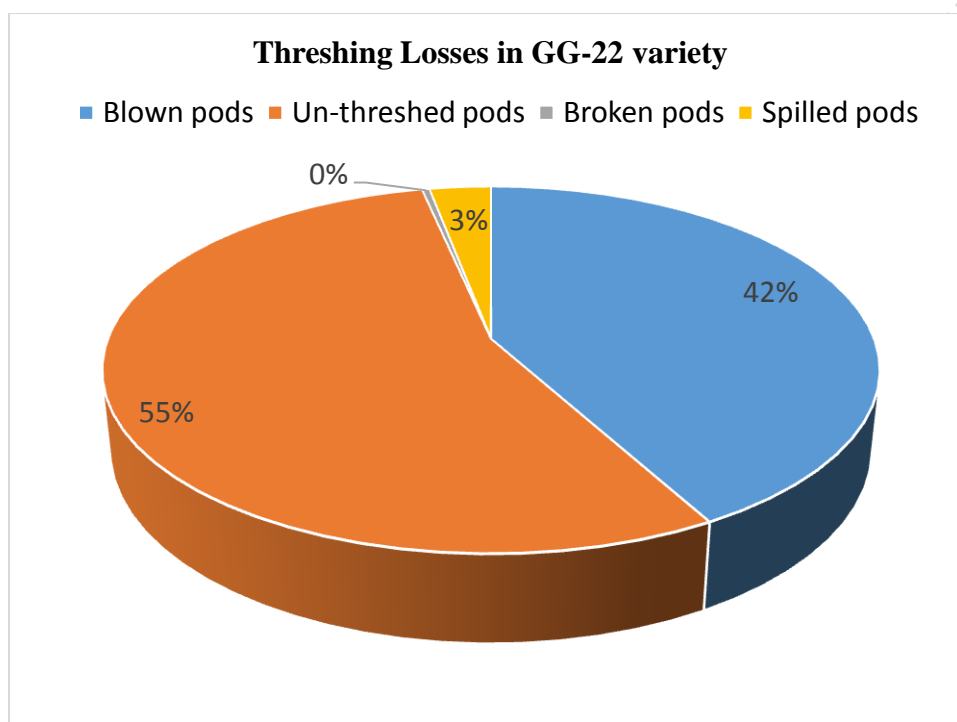
169 **Assumptions:**

Particulars	Thresher	Tractor
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Machine life	8 years	10 years
Salvage value	10 % of initial cost	10 % of initial cost
Annual use	300 hours	1000 hours
Interest rate	10 %	10 %
Housing cost	1.5 % of initial cost	1.5 % of initial cost
Insurance cost	2.0 % of initial cost	2.0 % of initial cost
Repair & maintenance	5.0 % of initial cost	5.0 % of initial cost
Fuel cost	-	64 Rs. / lit
Labour cost	300 Rs. Per day of 8 hr.	-

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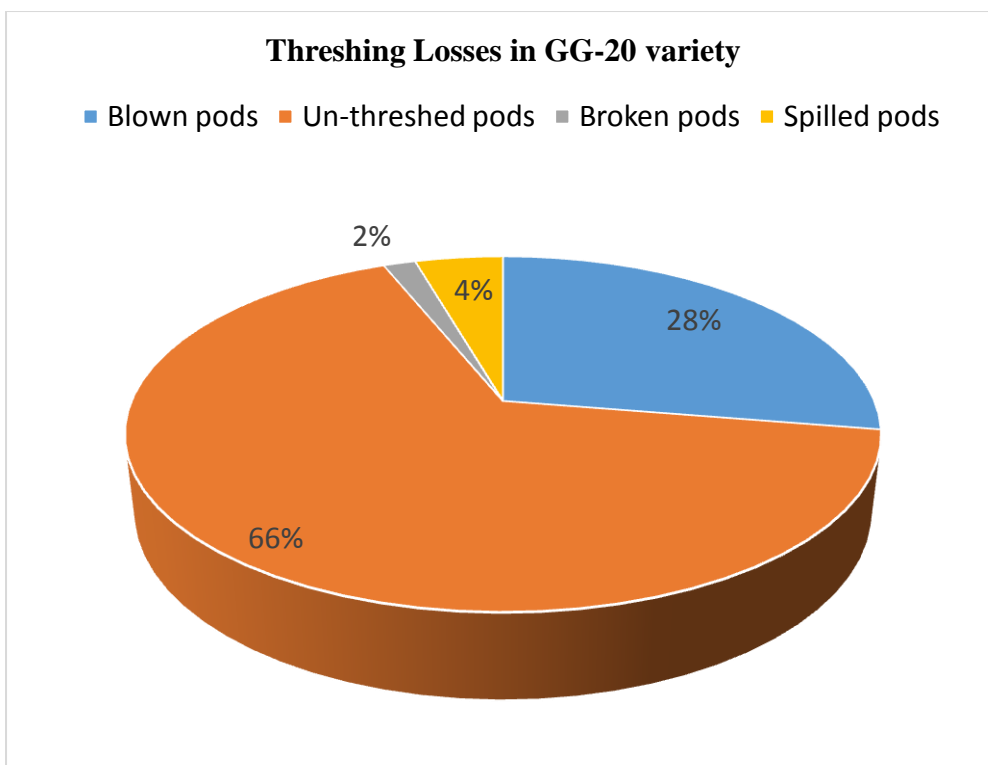


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Fig 3: Various losses during threshing operation for GG-22 variety



175

176 **Fig 4: Various losses during threshing operation for GG-20 variety**

177 **4.4.6. Threshing efficiency**

178 Threshing efficiency was varied from 79.3% to 82.38 % with an average value
 179 of 81.08 % for the variety GG-22. It was varied from 83.61 % to 86.48 % with an
 180 average value of 85.41 % for the variety GG- 20. Thus higher threshing efficiency
 181 was observed in GG-20 (85.41 %) as compared to GG-22 (81.08 %).

182 **Table 4.7: Threshing efficiency for GG-22 and GG-20 varieties**

Sr. No.	For variety GG-22, %	For variety GG-20, %
1	81.56	86.48
2	79.30	83.61
3	82.38	86.13
Av.	81.08	85.41

183

184 **4.4.7. Cleaning efficiency**

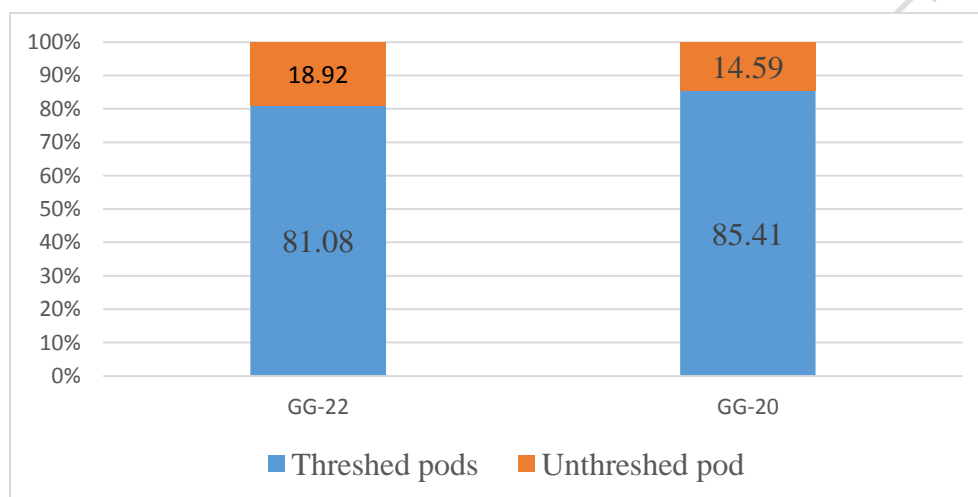
185 Cleaning efficiency varied from 85.89 % to 90.80 % with an average value of
 186 88.19 % for the variety GG-22. It was varied from 88.39 % to 89.35 % with an
 187 average value of 88.74 % for the variety GG-20. It was observed that due to sufficient
 188 drying of the crop the groundnut was separated easily and efficiently from the foreign

189 materials (stone, soil and plant stem). Thus higher cleaning efficiency was obtained
 190 for both the varieties.

191 **Table 4.8: Cleaning efficiency for GG-22 and GG-20 varieties**

Sr. No.	For variety GG-22, %	For variety GG-20, %
1	87.95	89.35
2	85.89	88.39
3	90.80	88.47
Av.	88.21	88.74

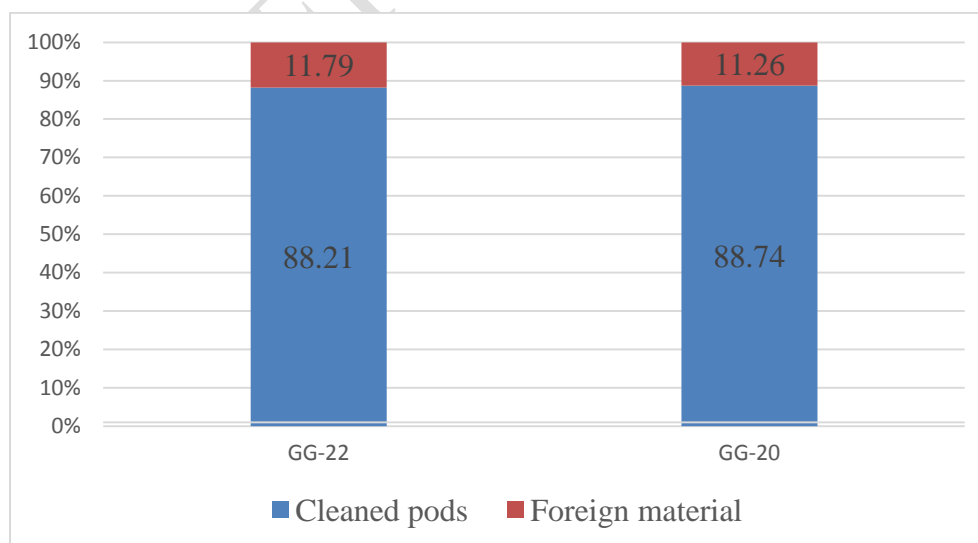
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193

194 **Fig 5: Percentage of threshed and unthreshed pods for GG-22 and GG-20 varieties**

195



196

197 **Fig 6: Percentage of cleaned pods and foreign material for GG-22 and GG-20 varieties**

198 **4.5 Cost of Operation**

199 Cost of groundnut threshing was calculated in terms of fixed cost and

200 Operating costs:

201 **4.5.1 Cost calculation for thresher**

Sr. No.	Particulars	Value	
		Thresher	Tractor
1.	Fixed cost		
a.	Depreciation, Rs/hr	57.75	67.50
b.	Interest, Rs/hr	28.23	41.25
c.	Housing, Rs/hr	7.70	11.25
d.	Insuarance and taxes, Rs/hr	10.27	15
	Total fixed cost, Rs/hr	103.95	135
2.	Variable cost		
a.	Fuel cost, Rs/hr	-	160
b.	Oil cost, Rs/hr	-	4.8
c.	Repair and maintenance cost, Rs./hr	25.67	37.5
d.	Wages, Rs/hr	225	37.5
	Total variable cost, Rs/hr	250.67	239.8
3	Total (Fixed + variable) cost, Rs/hr	354.62	374.8
4	Total threshing cost, Rs/hr	729.42	
5	Average cost of groundnut threshing, Rs/kg	1.56	

202

203 **CONCLUSION**

204 The average pod-vine ratio for groundnut variety GG-22 was observed as
 205 0.3353 having moisture content of pods and vine as 11.73 and 11.53 % (d.b.)
 206 respectively. The average pod-vine ratio for groundnut variety GG-20 was observed
 207 as 0.5836 having moisture content of pods and vine as 6.81 and 12.92 % (d.b.)
 208 respectively. The crop feed rate for groundnut variety GG-22 was varied from
 209 2033.89 kg/h to 2117.65 kg/h with an average value of 2115.55 kg/h at a threshing
 210 cylinder speed of 292 rpm. The crop feed rate for groundnut variety GG-20 was
 211 varied from 1282.05 kg/h to 1298.70 kg/h with an average value of 1304.69 kg/h at a
 212 threshing cylinder speed of 421 rpm. The average pod output capacity for groundnut
 213 variety GG-22 was observed as 524.66 kg/h and it was varied from 518.63 kg/h to
 214 531.97 kg/h. The average pods output capacity for groundnut variety GG-20 was
 215 observed as 407.60 kg/h and it was varied from 375.41 kg/h to 454.79 kg/h. The
 216 average percentage of blown pods, un threshed pods, broken pods and spilled pods

217 were observed as 14.51, 18.92, 0.126, 1.04 % and 6.07, 14.59, 0.361, 0.99 % for GG-
218 22 and GG-20 varieties, respectively.

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APPENDIX I
Size of Groundnut Pods for GG-22 and GG-20 varieties

Sr. No.	Size of groundnut pods		Size of groundnut pods	
	GG-22		GG-20	
	Length, mm	Width, mm	Length, mm	Width, mm
1	29.55	13.10	25.89	11.44
2	37.37	12.95	29.72	15.15
3	18.75	12.76	31.88	14.55
4	30.18	11.14	29.78	13.32
5	28.50	10.64	22.76	8.98
6	23.04	11.38	33.12	13.34
7	30.07	9.83	27.34	14.20
8	16.95	10.22	24.44	10.15
9	17.44	9.56	26.80	12.63
10	26.33	12.26	28.09	12.87
11	36.01	13.28	21.18	8.36
12	22.34	10.89	28.95	12.97
13	31.04	12.66	23.44	10.55
14	16.46	9.84	28.60	14.88
15	31.24	13.37	28.51	13.43
16	29.98	12.01	28.02	12.76
17	17.26	11.42	28.42	13.00
18	28.70	12.15	29.48	13.34
19	35.41	13.45	28.03	12.46
20	36.85	15.36	29.26	12.95
21	25.16	11.33	29.63	12.97
22	34.48	13.44	20.32	10.41
23	19.16	10.76	26.73	11.25
24	26.61	12.90	32.06	13.41
25	29.84	13.67	26.51	15.93
26	30.46	12.69	34.82	13.53
27	25.79	10.37	25.58	13.07
28	24.83	11.68	24.91	13.82
29	26.54	12.48	31.75	14.11
30	22.18	11.62	32.48	15.08

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APPENDIX II

Determination of Pod-vine Ratio for GG-22 and GG-20 varieties

The determination of pod and vine ratio was calculated by taking 4 samples of crop at random. Then, the bold pods were separated from the vines manually for each sample and weighed.

Variety	Sample No.	Total weight (g)	Weight of pods (g)	Weight of vines (g)	Pod-vine ratio (%)
	(A)	(B)	(C)	(D)	$E=(C/D)*100$
GG-22	1	975.5	249.0	726.5	34.27
	2	1034.0	234.0	800.0	29.25
	3	831.5	196.5	635.0	30.94
	4	906.0	252.0	654.0	38.53
	5	1117	287.5	829.5	34.66
	Average				
GG-20	1	1210	440	770	57.14
	2	1153	451	702	64.24
	3	1189	460	729	63.10
	4	1247	425	822	51.70
	5	1105	395	710	55.63
	Average				

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APPENDIX III

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Determination of Moisture Content of Pod and Vine for GG-22 & GG-20 varieties

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The moisture content of groundnut pods and vine was determined on dry basis. The oven dry method was used for determination of moisture content by taking five samples randomly. The samples were weighed and kept in oven for 24 hours at 105° C. The samples were weighed after drying. The moisture content was calculated by using the following formula:

$$MC \% (d. b.) = \frac{W_1 - W_2}{W_2 - W}$$

Where:

W_1 = Mass of material and dish before drying (g)

W_2 = Mass of dish with dried material (g)

W = Mass of empty dish (g)

Variety	Pod sample No.	W_1 (g)	W_2 (g)	W (g)	Moisture content (d.b.) (%)
	(A)	(B)	(C)	(D)	$(E)=100(B-C)/(C-D)$
GG-22	1	69.0	64.5	26.0	11.68
	2	60.0	56.5	26.0	11.47
	3	75.0	69.5	24.0	12.08
	4	63.0	59.0	25.5	11.94
	5	77.5	72.0	24.0	11.46
	Average				

	Vine sample No.	W ₁ (g)	W ₂ (g)	W (g)	Moisture content (d.b.) (%)
	(A)	(B)	(C)	(D)	(E)=100(B-C)/(C-D)
	1	36.5	35.5	26.0	9.26
	2	38.5	37.0	24.5	11.54
	3	38.5	37.0	25.5	9.67
	4	41.0	39.5	28.0	11.53
	5	40.0	38.5	24.5	9.67
	Average				10.33

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Variety	Pod sample No.	W ₁ (g)	W ₂ (g)	W (g)	Moisture content (w.b.) (%)
	(A)	(B)	(C)	(D)	(E)=100(B-C)/(C-D)
	1	84.0	80.0	26.0	7.40
	2	80.5	77.0	24.0	6.60
	3	80.0	76.0	24.5	7.6
	4	81.5	78.5	25.5	5.65
	Average				6.81
GG-20	Vine sample No.	W ₁ (g)	W ₂ (g)	W (g)	Moisture content (w.b.) (%)
	(A)	(B)	(C)	(D)	(E)=100(B-C)/(C-D)
	1	38.0	37.0	25.5	8.69
	2	38.5	37.0	25.5	13.04
	3	43.5	41.0	28.0	19.22
	4	41.0	39.5	25.5	10.72
	Average				12.92

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APPENDIX IV

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Test results of the groundnut thresher performance

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Observations for groundnut variety GG-22

Sr. No.	Parameters	Test Trials		
		I	II	III
1	Duration of test, hr	0.047	0.049	0.046
2	Variety of groundnut crop	GG-22	GG-22	GG-22
3	Feeding rate, kg/hr	2117.65	2033.89	2195.12
4	Pod output, kg/hr	518.63	523.38	531.97
5	Fuel consumption, lit/hr	2.44	2.51	2.42
6	Capacity, kg/lit			
	Input	867.89	810.31	907.07
	Output	212.55	208.52	219.82

7	Losses on the basis of total pod output (%)			
	Broken	0.088	0.123	0.168
	Blown	15.31	16.05	12.17
	Un-threshed	18.44	20.70	17.62
	Sieve overflow	0.00	0.00	0.00
	Total loss	33.84	33.53	29.96
8	Efficiency (%)			
	Cleaning	87.95	85.89	90.80
	Threshing	81.56	79.30	82.38
9	Machine parameters			
	1. PTO speed, rpm		342	
	2. Cylinder speed, rpm		292	
	3. Main blower speed, rpm		627	
	4. Shaker speed, rpm		182	
	5. Inclination of top sieve, degree		5	
	6. Inclination of bottom sieve, degree		10	

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Observations for groundnut variety GG-20

Sr. No.	Parameters	Test Trials		
		I	II	III
1	Duration of test, hr	0.077	0.075	0.078
2	Variety of groundnut crop	GG-20	GG-20	GG-20
3	Feeding rate, kg/hr	1298.70	1333.33	1282.05
4	Pod output, kg/hr	392.59	375.41	454.79
5	Fuel consumption, lit/hr	2.160	2.064	2.196
6	Capacity, kg/lit			
	Input	601.25	645.99	583.81
	Output	181.75	181.88	207.10
7	Losses on the basis of total pod output (%)			
	Broken	0.372	0.337	0.373
	Blown	4.343	8.584	5.292
	Un-threshed	13.522	16.391	13.875
	Sieve overflow	0.000	0.000	0.000
	Total loss	18.237	25.312	19.540
8	Efficiency (%)			
	Cleaning	89.35	88.39	88.47
	Threshing	86.48	83.61	86.13
9	Machine parameters			
	1. PTO speed, rpm		480	
	2. Cylinder speed, rpm		421	
	3. Main blower speed, rpm		775	
	4. Shaker speed, rpm		236	
	5. Inclination of top sieve, degree		5	
	6. Inclination of bottom sieve, degree		10	

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APPENDIX V

354 **Calculation of cost of operation by Straight-Line Method**

355 **Assumptions:**

Particulars	Thresher	Tractor
Machine life	8 years	10 years
Salvage value	10 % of initial cost	10 % of initial cost
Annual use	300 hours	1000 hours
Interest rate	10 %	10 %
Housing cost	1.5 % of initial cost	1.5 % of initial cost
Insurance cost	2.0 % of initial cost	2.0 % of initial cost
Repair & maintenance	5.0 % of initial cost	5.0 % of initial cost
Fuel cost	-	64 Rs. / lit
Labour cost	300 Rs. Per day of 8 hr.	-

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357 **Calculations:**

Sr. No.	Particulars	Value	
		Thresher	Tractor
1.	Fixed cost		
a.	Depreciation, Rs/hr	57.75	67.50
b.	Interest, Rs/hr	28.23	41.25
c.	Housing, Rs/hr	7.70	11.25
d.	Insurance and taxes, Rs/hr	10.27	15
	Total fixed cost, Rs/hr	103.95	135
2.	Variable cost		
a.	Fuel cost, Rs/hr	-	160
b.	Oil cost, Rs/hr	-	4.8
c.	Repair and maintenance cost, Rs./hr	25.67	37.5
d.	Wages, Rs/hr	225	37.5
	Total variable cost, Rs/hr	250.67	239.8
3	Total (Fixed + variable) cost, Rs/hr	354.62	374.8
4	Total threshing cost, Rs/hr	729.42	
5	Average cost of groundnut threshing, Rs/kg	1.56	

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