

Development and Testing of Longitudinal Slot Type Potato Grader

Er. Mahendra Rai¹, Dr. R.K. Mehta² & Er. R.J. Singh³

Associate Professor, Dept. of SWCE, MCAET, Ambedkar Nagar, Uttar Pradesh, India¹

Dean, MCAET, Ambedkar Nagar, Uttar Pradesh, India²

Associate Professor, Dept. of FMPE, MCAET, Ambedkar Nagar, Uttar Pradesh, India³

Abstract: The A.A.I. design longitudinal slot type Potato grader was modified and a new prototype was fabricated. The slope of sieves and their oscillating speed were standardised to achieve higher degree of grading efficiency and capacity. The thicker rubber beads have been provided to minimize the Potato damage. After above modification the Grader was tested. Based on the least slippage percentage and at minimum vibration of machine the suitable oscillation rate of sieve was found to be 385 per minute for efficient functioning of machine, maximum grading efficiency of 99.40 percent and a grading capacity of 30.92 quintal per hour was achieved. The energy consumption of Potato grader was found to be 0.025 kwh per quintal.

Keywords: Grader, cultivation, porosity, feeding hopper and sieves etc.

I. INTRODUCTION

Potato grading is not only beneficial for cultivation aspect but is also accounts for value addition, marketability and storage quality. When graded potato is kept in cold storage, the potato attains higher porosity, which helps in good and proper air circulation and temperature to maintain keeping quality. There are various methods of grading potato including manual shorting, use of different types of screens like wire and mesh or circular punched sheet. Few sophisticated equipments are also available. The handicapped of these methods are higher cost of shorting, damage to the potato, low grading capacity, uneven grading and higher cost of equipment. The grader developed at A.A.I. Allahabad needed some modifications and improvements. The objective of above study was to reduce vibration in machine, to reduce clogging of potato in the sieves, to reduce damage to potato, to increase grading capacity and efficiency of grader.

II. MATERIALS AND METHODS

The longitudinal slot type potato grader consists of two sets sieves with rubber beads, feeding hopper with feed control mechanism, power transmission unit, collecting unit and transportation wheel. The following improvement and modifications were made in machine.

1. Proper alignment was made between driving and driven pulley.
2. Four different Pulley sizes were tested to obtain suitable of oscillation rate of sieve.
3. Four steel pins were removed which were welded at lower face of the bottom frame and rewelded at upper face of bottom frame for reduction of vibration.
4. Slope of sieve was increased by 2% with lowering sieve by 5cm down and bolting arrangement was made.
5. Two M.S. flates on the sides along the edge of angle iron in inner frame were welded.
6. U-shaped rubber sheets of 3mm thickness were fitted on top of M.S. flates.
7. Two M.S. plates of size 12×10cm were welded at both the corners of lower end of sieve.

The machine was tested at 385 oscillation rate of sieve. After grading three grades of potato larger, medium and smaller were obtained.

III. RESULTS AND DISCUSSIONS

Vibration of machine and clogging of potato in sieves were reduced after above modifications. The damage to the skin of potato was very much reduced and it was found to be 0.4%. This improved grading machine gave an average output of 30.92 q/ha whereas it was only 18 q/ha before modification table 1. This improvement in grading capacity achieved

by increasing the oscillation and slope of sieve and by reduction in clogging and vibration. The efficiency of potato grader obtained on the basis of clogging and uneven grading was found to be 99.20%. This grading efficiency is quite higher and satisfactory.

Table 1. Testing of potato grader for its performance characteristics:

Sr No.	Time (mins)	Weight of potato Graded			Total Weight (kg)	Grading Rate		Ungraded (clogged & uneven grading) weight(kg)	Efficiency (%)
		Larger Size Potato (kg)	Medium Size Potato (kg)	Smaller Size Potato (kg)		Kg/min	q/n		
1.	1-30	46	35.500	0.500	82.200	54.66	32.80	0.470	99.43
2.	3-15	92	70.000	0.700	162.700	50.06	30.03	1.140	99.30
3.	4-30	128	98.000	0.600	226.600	50.35	30.21	1.400	99.38
4.	3-30	103	76.000	0.500	179.500	51.28	30.77	0.970	99.46
Total	12-45	369	279.500	2.300	650.800	Average		3.980	Minimum Effi.
						51.58	30.94		99.30

$$\text{Average capacity of grader} = \frac{51.90 + 51.15 + 51.58}{3}$$

(On the basis of test Nos. I, II, & III) = 51.543 kg/min
= 30.92 q/h

IV. CONCLUSION

It is concluded that longitudinal slot type potato grader performed better after necessary modifications and improvements. Better performances were in term of negligible damage on skin of potato, higher grading capacity (30.92 q/h), and three grades of potato, higher and satisfactory grading efficiency of 99.20%.

REFERENCES

1. Mopilasaery, S.J. 1973; design development and testing of potato grader B tech Agricultural engineering thesis AAI Allahabad.
2. Saw, N. Lawrence, Potato grading and packing paper presented at the 60th Annual meeting of ISAK.
3. TandonS.K. and Upadhyay S.M. 1971. Design fabrication and testing of potato seed grader BTech Agricultural engineering thesis AAI Allahabad.
4. FAO Bulletin 1995
5. Rai M., 1996 development and testing of longitudinal slot type potato grader M.Sc. Agricultural engineering thesis AAI Allahabad.