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Research Paper :

Performance evaluation of grass cutter

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ABSTRACT

The grass cutting machine is available in the various types like reel (cylinder) mower, rotary and mulching mower, hover mower, riding mower, professional mower etc. but these are very costly and unaffordable. It required a skilled person to operate. Hence, it was found necessary to have a grass cutter which can be operated by electricity (motor) with minimum initial cost and can be operated by unskilled labour. The newly developed grass cutter was able to operate at an average speed of 2km/hr without disturbance in operation. The effective field capacity of the machine was 0.07 ha/hr (*i.e.* to move one hectare in 14.30hr) with an efficiency of 70 per cent. 1 hp single phase electric motor was sufficient to operate at working width of 500mm cutter bar.

Key words : Development, Evaluation, Performance, Grass cutter

Agriculture is the most important sector in the Indian economy. In India there is a great scope of grass cutter machine. In our country as well as other countries has also , it is used in various fields for cutting the grass. The machine may consist of two, three or four blades depending upon the machine. The grass cutting machine is known as lawn mower. The grass cutting machine is available in the various types like reel (cylinder) mower, rotary and mulching mower, hover mower, riding mower, professional mower etc. but these are very costly and unaffordable also. Also, it requires a skilled person to operate it. Hence, it was found necessary to have a grass cutter which can be operated by electricity (motor) with minimum initial cost and can be operated by unskilled labour.

A vertical mounted electrical motor operated grass cutter was found to be an alternative to common rotor mower (Chanceller, 1958). The grass cutters do the better job of cutting grass or lawn grass. The vertical rotor shaft has many pairs of swinging knives that cut the grass at equal height. If the blade can not cut the grass by the first blade, then it can be cut by the other three remaining blades. The commercially available units for mowing or grass cutting are casting heavily. Hence, considering the needs for development of effective and economic grass management practice, the study was undertaken in the department of Farm Power and Machinery, Aditya College of Agril. Engg. and Tech., Beed (Maharashtra) in the year 2008.

METHODOLOGY

Working principle of grass cutter:

The grass cutter works on the principle of slicing action of the blades. The grass was cut above the ground surface without damaging the blades when it strikes on immovable object such as rock, stone. The grass cutting takes place due to impact and shearing action also.

The basic units of grass cutter:

Due attention was provided on the following design aspects while developing the grass cuter;

- Cutting unit
- Supporting frame
- Power unit
- Handle
- Transportation wheel

Cutting unit:

Cutting unit consisted of a cutter blades and a square plate.

The cutter blades were curved with externally sharpened edges fixed at an angle of 120^0 to the horizontal axis. The cutter blades were made of spring steel and the edges were hardened and tampered to the suitable hardness for longer service life. The blades were mounted over a square plate which was directly mounted on the motor shaft so that the blades get rotated at the same speed as the motor (*i.e.*1520rpm).

The square plate has eight numbers of holes at its corners (of 10mm diameter) for the attachments of 4 blades and a central hole (of diameter 17mm) for the motor shaft.

Motor shaft connects the square plate on which the blades were attached. All the parts were fastened permanently and semi permanently by the self locking nut and bolts.

Supporting frame:

The supporting frame consisted of a rectangular frame (470x300x30mm) made of 25x25x3 mm m.s. angles. The frame supports the supporting base made of well seasoned wooden plank of 450x290x25mm size.

Power unit:

Power to the blades was provided with the help of single phase electric motor of 1 hp.

Also an on-off lever/switch was also arranged on the handle to cut and start the electric supply.

Handle:

The handle was made of mild steel hollow pipe with an outside diameter of 20mm. It was provided for ease of driving the grass cutter by walking behind the machine (Fig. 1).

Transportation wheel:

Two pairs of front and rare wheels of 120mm diameter, axled by 20mm m.s. bars, made of 20mm m.s. flats were provided to support and carry the machine.

RESULTS AND DISCUSSION

The field test was conducted for the plot of 20x10m area as per the recommendations by the RNAM Test Codes (1983) to confirm the adaptability of grass cutter to the practical conditions.

Measurement of average height of grass:

The average height of grass was found to be 100mm.It was also found that cut height of grass not varied with height of grass before cut but was at constant height *i.e.*20mm from the ground because the grass cutter blades were non adjustable and hence this result, which was expected was found in this case (Table 1).

Speed of operation:

The speed of operation was totally dependent on speed of operator and was found to be an average of 2km/hr, after calculating an average time required to cover 20 m length of test plot. It was found that speed operation decreased with intensiveness of the grass to be cut.

Field capacity:

Also calculated data in the Table 1 reveal that theoretical field capacity was 1 ha/hr and the effective

Fig. 1 : Grass cutter

Table 1 : Field performance of grass cutter

Particulars	Observations
Operating width of machine, mm	500
Test plot size,m^2	20 x10 = 200
Kind of plot	Flat
Location of plot	In front of Aditya College of Agril. Engg. & Tech., Beed(M.S.)
Type of soil	Black cotton soil
Height of grass before cut, mm	100
Average height of grass after cut, mm	20
Total number of strips covered	20
Total number of turns	19
Time required to complete the operation excluding turning losses, sec	720(12 minutes)
Time lost owing to turning, sec	300(5 minutes)
Total time required to cover the plot including time losses, sec	1020(17 minutes)
Average speed of operation, km/hr	2km/hr
Theoretical field capacity, ha/hr	0.1
Effective field capacity	0.07
Field efficiency,%	70

field capacity was 0.07ha/hr. it means to cover one hectare land, it would require about 14-15hrs.

Field efficiency:

It was found that, for an average of 2km/hr operating speed, the field efficiency for the test plot was 70 per cent. The field efficiency was observed to be decreased as the speed of operation increased.

Conclusion:

The newly developed grass cutter was able to operate at an average speed of 2km/hr without disturbance in operation. The effective field capacity of the machine was 0.07 ha/hr (*i.e.* to move one hectare in 14.30hr) with an efficiency of 70 per cent. 1 hp single phase electric motor was sufficient to operate at working width of 500mm cutter bar.

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