

Design and evaluation of small machine for chopping corn cobs for feeding of livestock

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Animal feeding is one of the most serious problems facing animal producer and it can be solved by selecting the proper animal diet in the acceptable phase.

Animal feedstuff is a very important aspect of livestock husbandry as it is a major limiting factor in the rearing of animals to meet the increasing demand for animal protein, milk, hides, and skin and other products (Adgidzi, 2007).

Chopping of forage crops has an effect both on fermentation in the silo and on the utilization of forage by the animal. Chopped forage is more compressible and therefore exhibits greater density, a lower temperature rise, and lower dry matter losses during storage. The chopping also stimulates the release of cell sap and thus promotes the growth of lactic acid bacteria (McDonald, 1981). Both the mean particle size and variation in particle size are important nutritionally.

A machine for chopping feed has been developed. The machine is related to agricultural machinery and can be used in individual and small farms. The machine contains an inlet tube for feeding material, rubber fixed in the lower part of the body, frame, outlet tube for the exit of the finished product, drive shaft with knives connected to electric motor. Knives are installed vertically on the drive shaft, starting with small lengths. The length of knives increases gradually towards the bottom, while the distance between knives decreases.

A paddle is installed between the frame and the lower part of the body. Blades are mounted on the paddle to increase the crushing quality of the finished product. Rubber mounted on the bottom of the housing to reduce noise, and prevent the possible friction with the bolts.

The working criterion of the machine is as follows: The forage material from the inlet tube on the upper knife is crushed, and partially chipped; falling down towards the bottom it is again re-crushed by next knives. On this basis, the feed material is crushed while passing through all the knives.

This study aimed essentially to evaluate the performance of chopping machine at two different levels of corn moisture content, four levels of cutting speed and four angles of flow guides. The actual chopping time decreased with increasing the rotational speed of knives, while it decreased with decreasing both of the corn moisture content and flow guides angle. The highest actual chopping time (8.456 sec) was observed at 600 rpm of knives rotational speed, 30 angle and humid corn. The lowest actual chopping time (5.55 sec) was recorded at 1500 rpm of rotational speed with 0 angle and dry corn.

Cutting efficiency increases at high rotational speeds. The highest efficiency for chopping occurred at 1200 and 1500 speeds. Cutting efficiency and variation of cutting lengths increased by increasing both of rotational speed of knives and angle of flow guides. By decreasing moisture content of corn; the cutting efficiency and variation of cutting lengths increased. The required power for chopping processes increased with increasing rotational speed of knives and corn moisture content. The required power for chopping did not change by changing flow guides angles

References

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