Design Development of Self Suspended Dispenser

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***Abstract*— Sowing of a seed at uniform depth with uniform width of cut not maintained in conventional type of sowing machine tines which results in non uniform growth of plants and hence there is loss in the yield of farmer. The use of self suspended dispensing coulter achieves the uniform depth as well as uniform width of cut and hence there is uniform growth of plants and ultimately there is increment in farmers yield. There must be a conservation moisture contents in soil after furrow is open. But in case conventional type of sowing machine there is not any such provision. Self suspended dispensing coulter allows simultaneous covering of furrow immediately by using passive double inclined disc to retain moisture after furrow is open. In order to increase the germination rate of seed, there is no such a provision in case of conventional type of sowing machine. Self suspended dispensing coulter allows pressing of seed slightly so that soil molecules firmly comes in contact with seed and the germination rate is increase. Shovel type furrow opener produce greater soil disturbance with ultimately requires unnecessarily more draft force for pulling of tractor. Thus main objective of this project is to maintain uniform seed depth with uniform width of cut with conserving moisture content after furrow is open by closing it and pressing of seed in order to increase the germination rate with reduced draft force. This paper presents the calculation of draft force and effect of depth in width of cut on draft force.**

***Index Terms*— Disc opener, uniform depth, draft force, germination, pressure.**

I. INTRODUCTION

During the sowing process in agriculture field it is observe that the seed depth is non uniform. Result of which there is non uniform growth of plants. It may possible that one of the plant contains 100 numbers of fruits and second should have only 50 numbers of fruits. During the harvesting process this uneven growth of plants as well as uneven fruits of plants does not take into consideration. Thus result of which there is reduction in overall yield of farmer . It may possible that this uneven growth of plant is due to the germination of seed, quality of seed, etc. The one of the reason for this non uniform growth of plants is use of conventional type of tines. The Self Suspended Dispensing Coulter comprises consist of two disc which are inclined to each other and are symmetrically fitted. The function of these two disc is to open the furrow at required width in order to dispense the seed fertilizer. The compression spring is used to give the load on the disc. Two passive double inclined disc are used for covering of seed and fertilizer in order to retain moisture in soil and increases the germination rate. It is also provided with `spring load for uniform covering of seed. The slight pressure on the seed results in firm contact of soil molecules with the seed which increases the germination rate as well as fast initial growth of plant.

OBJECTIVE

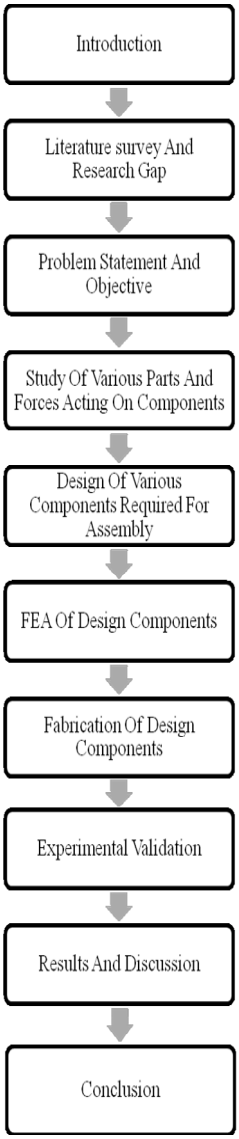
The main objective of this paper is to design a customized self suspended dispensing coulter. This objective can be broken down into the following sub-objectives :

- To maintain uniform seed depth during the sowing.
- To reduce the drag force required for tractor.
- To design a seed dispenser coulter conceptually and then in detail.

Scope

In Indian agriculture farming the seed as well as fertilizer is drop at same depth, thus there is scope. To place the fertilizer below the 20 mm of seed level because seed does not need immediate fertilizer for its growth.

Methodology



Research gap Most of the research is carry on in calculating the drag force by considering only one parameter in consideration i.e. the depth of cut, there is no comparative analysis of available in any research paper indicating the relationship between depth of cut and the width of cut. In case of rabbi season the moisture content is somewhat at lower side as compared to khariff season, there is no research on improvement of germination seed by opening furrow, dispensing a seed and immediately covering of seed by using passive double inclined disc . Also the seed germination depends upon how much seed is closely contacted with the soil particles. No study of press wheel is found in the research paper. The slight pressure on the seed by the use of press wheel increases the germination rate of the seed.

2. Material And Methods

The diameter of the furrow opening disc is 304 mm and is made up of stainless steel material which is always come in contact soil. It is provided with spring load of 941 N. The double inclined furrow opener is provided with inclined angle of 7 degree. According to above parameters take into consideration the draft force is calculated. The covering of seed is done by passive double inclined covering disc and is also press with pressing wheel mechanism.

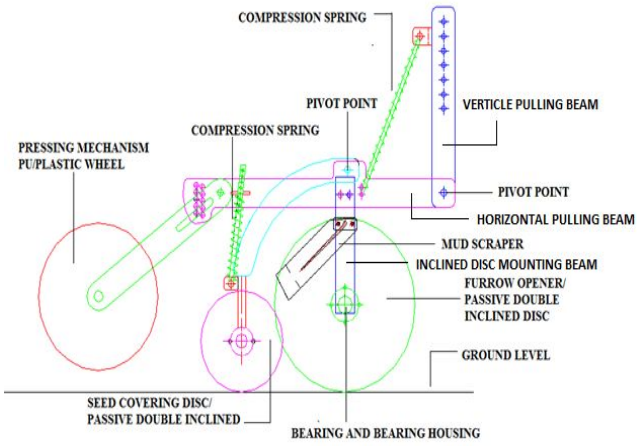
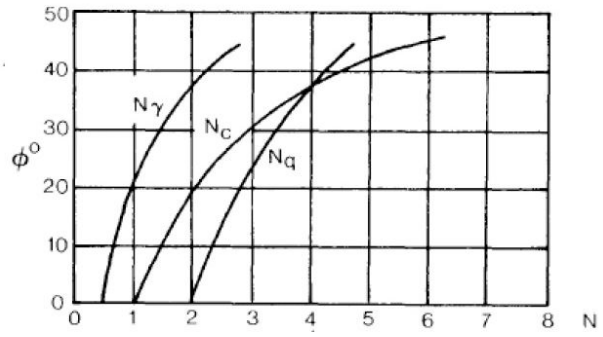


Fig.1 Construction of self suspended dispenser.

2.1 Graph of N factor based on soil friction angle.



2.2 Draft force calculation

Reece proposed the following equation as a universal earth moving equation for describing the force necessary to cut soil with a tool.

$$P = (\gamma g d^2 N_\gamma + c d N_c) w \quad \ldots(4.1)$$

P = Drag force of disc, N.

γ = bulk density of clay soil = 2.837 gram per cc

..(Swiss Standard SN670 o10 b)

g = 9.81 m/s^2

d = Working depth, mm

c = soil cohesion strength for clay compacted

= 74 kPa.

..Soil Cohesion Geotechdata.info – Update 31.10.2014.

w = Tool width, mm.

Agriculture in Maharashtra is mostly done in black soil. Hence the draft force considered for design is calculated for black soil.

$N_\gamma = 1.5$

$N_c = 3$

$$P = (\gamma g d^2 N_\gamma + c d N_c) w \quad \ldots(4.2)$$

$$P = [(27.83 \times 10^3 \times 9.81 \times 0.0762^2 \times 1.5) + (74 \times 10^3 \times 0.0762 \times 3)] \times 0.08$$

P = 1543.53 N

P $\cong$ 1550 N

3. Placing the tables

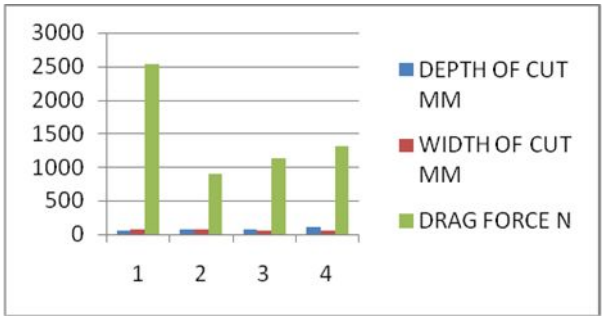


Fig 3.1 : Effect of depth of cut and width of cut on drag force

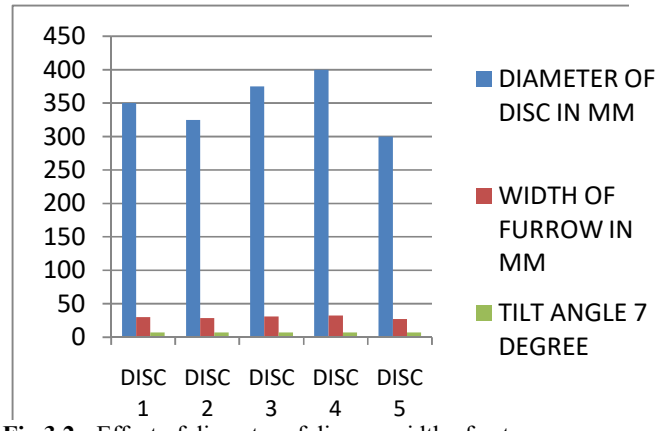


Fig 3.2 : Effect of diameter of disc on width of cut

CONCLUSIONS

From above results it is concluded that when we go for more deep in a soil the draft force is increases where as when width of cut is increase the draft force is also increases. It is observe that when the depth of cut and width of cut same at that time draft force require for pulling a tractor is reduced. Diameter of furrow opener disc the furrow opening disc directly proportional to the width of furrow. The downward force Fsm is depends upon the length L1. Pressure on the dispensing disc can be reduce easily by just loosing the nut fitted on the compression spring. The tilt angle of disc is directly proportional to the draft force required for tractor.

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