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SUMMARY AND CONCLUSION

Due to lack of machine for threshing and cleaning small seeds such as onion and parseem to be used as seeds which makes farmers abstain from planting these crops for such aim.

The main purpose of this study is serving small cultivated areas for obtained clean seeds due to the lack of these probabilities especially in new lands; this machine is a small one gives a relative high production.

The present study included a new design of threshing and cleaning machine. This machine is suitable for small seeds.

The main parts of the threshing and cleaning machine are:

- Frame.
- Feed hopper.
- Threshing unit.
- Cleaning unit.
    i. Tow cleaning sieves.
    ii. Axial blower.
- Power source.
- Drive mechanism.
- Reservoir for seeds.

The crops are fed on the feed hopper manually. The crops move axially between the drum and the concave, preliminary separation of the seed out of the straw accurse.

The seeds and the straw are dropped from threshing unit to cleaning unit which consists of two cleaning sieves {the first sieve is 0 degree with horizontal which used for separating coarse straw from seed while the second sieve is 30 degree with horizontal which used to separating unthreshed seeds} and axial blower which has four steel rectangular blades {controlling air fan speed was done by controlling the airflow rate by using gates}.

The machine is driven by gasoline variable speed motor; the power was transmitted from the source to the all parts of the machine by using many pulleys.

The performance of threshing machine were tasted and evaluated up to the following points:

1. Physical properties and grain index.
2. Performance of thresher:
    i. Machine capacity kg/h.
    ii. Total seeds losses% :
        - Unthreshed seeds losses %.
        - b. Seeds losses with straw %.
        - c. Total seeds damage %:
            - Visible seeds damage%.
            - Invisible seeds damage %.
    iii. Seeds index%.
    iv. Threshing efficiency %.
    v. Cleaning efficiency %.
    vi. Fuel consumptions L/h.
    vii. Power requirement kW.
    viii. Useful power kW.
    ix. Specific energy kw.h/kg.
    x. Fuel cost L.E/h.
    xi. Total cost L.E/h.
    xii. Criterion cost L.E/h.

The performance of manufactured thresher was considered under the following factors.

1. Three threshing cylinder speed.
   (520, 573 and 625 rpm) for onion and parseem.
2. Three cleaning air fan speed.
   (1.8, 2.3 and 2.8 m/s) for onion.
   (1.2, 1.8 and 2.3 m/s) for parseem.
3. Three crop moisture content.
   (7, 9 and 11%) for onion.
   (10, 11.5 and 13%) for parseem.

The data of threshing machine were analyzed and the relationship between independent variable and other variable under study could be summarized as follows:

6-1:Physical and mechanical properties of seeds:

For onion:

The mean seed length was 3.02mm, seed width was 1.28 mm and seed thickness was 0.88mm. The mean of weight of 1000 seeds was 3.5 g.

For parseem:

The mean seed length was 2.45 mm, seed width was 1.2mm and seed thickness was 1.15 mm. The mean of weight of 1000 seeds was 2.85 g.

6-2 : Performance of thresher:

6-2-1: Machine capacity kg/hr :

The machine capacity kg/h increased by increasing drum speeds from 520 to 625 rpm.

The highest values of machine capacity were 61, 51 and 45 kg/h at crop moisture content 7, 9 and 11% respectively at drum speed 625 rpm for onion. While they were 62, 53 and 49 kg/h at crop moisture content 10, 11.5 and 13 % respectively at the same drum speed for parseem.

6-2-2: Total seeds losses%:

Total seeds losses % are the sum of Unthreshed seed losses%, seeds losses with straw%, visible seed damage% and invisible seed damage%.

Total seeds losses % increased by increasing drum speed, crop moisture content and air fan speed.

The lowest value of total seed losses% were 8.17, 8.31 and 9.34 % at crop moisture content 7, 9 and 11% respectively at drum speed 520 rpm and air fan speed 1.8 m/s for onion. And they were 6.89, 7.11 and 8.56 % at crop moisture content 10, 11.5 and 13% respectively at drum speed 520 rpm and air fan speed 1.2 m/s for parseem.

6-2-3: Seeds index%:

Seed index % decreased by increasing drum speed, while it increased by increasing crop moisture content.

The highest values of seed index were 97.76, 98.67 and 99.11 % at crop moisture content 7, 9 and 11% respectively at drum speed 520 rpm for onion. And they were 98.49, 99.04 and 99.24 % at crop moisture content 10, 11.5 and 13 % respectively at the same drum speed for parseem.

6-2-4: Threshing efficiency %:

Threshing efficiency % increased by increasing drum speed from 520 to 625rpm, while it decreased by increasing crop moisture content.

The highest values of threshing efficiency % were 97.96, 96.46 and 95.77 % at crop moisture content 7, 9 and 11% respectively at drum speed 625 rpm for onion. They were 98.05, 96.61 and 95.50 % at crop moisture content 10, 11.5 and 13 % respectively at the same drum speed for parseem.

6-2-5: Cleaning efficiency%:

Seeds were cleaned according to weight by means of the air system and according to the width and thickness on the screens.

Cleaning efficiency % increased by increasing air fan speed, while decreased by increasing crop moisture contents.

The highest values of cleaning efficiency were 97.93, 97.07 and 94.52% at crop moisture contents 7, 9 and 11% respectively at drum speed 625 rpm and air speed 2.8 m/s for onion. While they were 96.67, 95.72 and 93.16 % at crop moisture content 10, 11.5 and 13 % respectively and at air fan speed 1.2 m/s at the same drum speed for parseem.

6-2-6: Fuel consumption L/h:

Fuel consumption increased by increasing both of drum speeds from 520 to 625 rpm and crop moisture contents from 7 to 11% fore onion and from 10 to 13 % for parseem.

The lowest values of fuel consumption were 1.620, 0.231 and 0.314 l/h at crop moisture contents 7, 9 and 11% respectively at drum speed 520 rpm for onion.

While they were 0.220, 0.318 and 0.401 l/h at crop moisture contents10.5, 11 and 13% respectively at the same drum speed for parseem.

6-2-7: Power requirement kW:

Power requirement increased by increasing both of drum speeds from 520 to 625 rpm and crop moisture contents from 7 to 11% for onion and from 10 to 13 % for parseem.

The lowest values of power requirement were 0.45, 0.64 and 0.87 kW at crop moisture contents 7, 9 and 11% respectively at drum speed 520 rpm for onion. And they were 0.61, 0.88 and 1.11 kW at crop moisture content 10, 11.5 and 13% respectively at the same drum speed for parseem.

6-2-8: Useful power kW:

Useful power decreased by increasing drum speeds from 520 to 625 rpm, while increased by increasing crop moisture contents.

The highest values of useful power were 1.125, 1.258 and 1.418 kW at crop moisture contents 7, 9 and 11% respectively at drum speed 520 rpm for onion. And they were 1.328, 1.528 and 1.668 kW at crop moisture content 10, 11.5 and 13 % respectively at the same drum speed for parseem.

6-2-9: Specific energy kW.h/kg:

Energy increased by increasing both of drum speeds from 520 to 625 rpm and crop moisture contents from 7 to 11% for onion and from 10 to 13 % for parseem.

The lowest values of energy were 0.011, 0.017 and 0.030 kW.h/kg at crop moisture contents 7, 9 and 11% respectively at drum speed 520 rpm for onion. And they were 0.014, 0.022 and 0.034 kW.h/kg at crop moisture content 10, 11.5and 13% respectively at the same drum speed for parseem.

6-2-10: Total cost L.E/h:

Total cost increased by increasing both of drum speeds from 520 to 625 rpm and crop moisture contents from 7 to 11% for onion and from 10 to 13 % for parseem.

The lowest values of total cost were 5.11, 5.17 and 5.24 L.E/h at crop moisture contents 7, 9 and 11% respectively at drum speed 520 rpm for onion. While they were 5.17, 5.24 and 5.31 L.E/h at crop moisture content 10, 11.5 and 13 % respectively at the same drum speed for parseem.

6-2-11: Criterion cost L.E/h:

Criterion cost increased by increasing drum speed from 520 to 625 rpm but decreased by increasing crop moisture contents.

The lowest values of criterion cost were 329.11, 302.17 and 259.94 L.E/h at crop moisture contents 7, 9 and 11% respectively at drum speed 520 rpm for onion. While they were 35.95, 32.78 and 31.68 L.E/h at crop moisture content 10, 11.5 and 13 % respectively at the same drum speed.

Conclusion:

It was noticed that:

1. The highest values of threshing efficiency for a new machine at drum speed 625rpm for different moisture content.
2. The highest values of cleaning efficiency for a new machine at drum speed 625 rpm at different moisture content and air fan speed 1.8 and 1.2 m/s for onion and parseem respectively
3. The highest values of seed index for the machine at drum speed 520 rpm at different moisture content.
4. The lowest value of total seed losses for a new machine at drum speed 520 rpm at different moisture content and air fan speed 1.8 and 1.2 m/s for onion and parseem respectively.
5. The lowest value of the criterion cost for a new threshing machine at drum speed 520 rpm at different moisture content.