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# Evaluation of the Craftsman Divider for Applications on Experimental Plot Seeders

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A new divider has been developed by University of Manitoba Crop Science Department and Craftsman Machine Co. The divider differs from previous models in that there are no power requirements, and the sample to be divided passes through the divider before the cone dispensers. This allows a single sample to be divided in the field, but eliminates some of the problems previously encountered with dividers such as excessive time lag between seed dispensing and ejection by the divider, the need to keep the divider level to maintain accuracy while traversing the plot, and danger of plugging the small oriface required for spinning element dividers. The divider was tested for accuracy of division and repetition, and is reported here.

## Description

The divider (Fig. 1) tested consists of a square, four pocketed cast aluminum housing with equal divisions. A stationary cone, 5 cm in diameter, is fitted to the centre of the housing and rises above the housing. A feed cup is fitted over the cone apex and is free to move up and down in a journal positioned over the housing. A lever was supplied to lift the feed cup up to release seed held in the cup. Each pocket of the divider is funnel shaped and ends in a spout projection.

In operation the divider is mounted above individual row seed cones and has hoses connected between each of the spouts of the divider and the seed cups of the cones. Seed is placed in the divider seed cup, the lever lifted quickly, and after the seed has passed into

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the seed cups of the cones, they are tripped and the seeder is ready for traversing a plot. This operation can be done while the seeder is in motion and requires only one seeder operator per plot for dispensing seed.

Testing

The divider was stationary tested using several products and amounts with the divider level and one product and amount at a predetermined slope to evaluate performance on sloping land. All samples were weighed before and after dividing with an electronic balance with accuracy to .01 gram. The results are tabulated in Table 1 showing average output of each spout over a number of runs, maximum numerical deviation from the mean for each run and Standard Deviation and Coefficient of Variation of the output of each spout to show repeatability. Column "between spouts" shows results of division accuracy, and shows the percentage difference between the theoretical mean and the actual mean output of each spout. The last column gives Standard Deviation and Coefficient of Variation of the four averaged outputs. For testing effect of sloping land, the divider was sloped 4.5$^{o}$ for one test. Results are shown last and can be compared to the test in the third line.

Alterations to equipment prior or during testing

The divider was mounted on a temporary test stand and levelled. Some side pull was noticed in the lever linkage, so the lever was removed and the cup lifted by hand. This appeared to improve accuracy somewhat in pre-testing.

Discussion

The divider did well in repeatability with C.V.% values lower than those expected with spinning element dividers (1). Dividing ability (ability to divide the sample into equal parts) was good for small grained particles such as fertilizer or rape, but deteriorated as the grain size was enlarged becoming unacceptable for division of soybeans. For some unexplained reason the divider was more accurate on samples of 50 to 100 grams of cereal grains than those of 150 grams. This would indicate that where large samples are involved, the sample should be split, or where there is a continuous need for large capacities, redesign of the dividing element.

The test made with the dispenser tipped slightly indicates that the divider is subject to error when used on sloping land. This error can be eliminated by mounting the divider on a ball joint and levelling the unit before the cup is lifted. This would be practical because the cup is only lifted momentarily for each plot rather than over the plot length as is the case with spinning element types. The division accuracy for small samples is similar or better than spinning element types and volumetric seed dispensers. Accuracy of division on the unit tested was noted to be partly due to manufacture as spout #2 was continuously high and spout #3 continuously low. It is suggested that C.V.% values could be reduced substantially by altering the interior of the divider slightly at the dividing wall between pockets #2 and #3. Such testing and adjusting should be considered by any potential users.

The divider appears to have merit for some plot seeding applications where it is desireable to have a cone for each row and a single loading device for all rows when all rows are of the same material. This divider is of interest in further automation of plot seeding techniques as it lends itself well to a magazine loading device where seed would be loading into a series of containers and automatically ejected into the system as the seeder traverses a range.

References

1. Hergert, G.B. and F.B. Dyck. 1970. A four way divider for plot seeders. Can. J. Plant Sci. 50: 513 - 515.

Table 1. Division capabilities of Craftsmen divider showing 1. average output of each spout, 2. maximum numerical differences between average and maximum and minimum values, 3. standard deviation coefficient of variation of output of each spout, 4. Percent difference between theoretical mean output and average output of each spout, and 5. standard deviation and coefficient of variation between spouts, for several products and amounts.

| Product | Outlet #1 | | | Outlet #2 | | | Outlet #3 | | | Outlet #4 | | | Between Spouts | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Average Amount | Maximum Numerical Deviation from mean | Standard Deviation / Coefficient of Variation | Average Amount | Maximum Numerical Deviation from mean | Standard Deviation / Coefficient of Variation | Average Amount | Maximum Numerical Deviation from mean | Standard Deviation / Coefficient of Variation | Average Amount | Maximum Numerical Deviation from mean | Standard Deviation / Coefficient of Variation | Average Deviation between Spouts in % 1 | 2 | 3 | 4 | Standard Deviation / Coefficient of Variation |
| Oats 100 g | 24.51 | +0.2<br>−0.26 | 0.12 / 0.49% | 25.77 | +0.12<br>−0.14 | 0.10 / 0.39% | 24.22 | +0.15<br>−0.05 | 0.08 / 0.23% | 25.46 | +0.18<br>−0.17 | 0.11 / 0.43% | −1.92% | +3.12% | −3.08% | +1.68% | 0.74 / 2.96% |
| Oats 150 g | 36.71 | +2.28<br>−1.40 | 1.16 / 3.16% | 41.99 | +2.25<br>−2.46 | 1.10 / 2.62% | 34.32 | +2.68<br>−1.60 | 1.10 / 3.21% | 36.86 | +1.73<br>−0.55 | 1.09 / 2.96% | −2.03% | +12.1% | −8.4% | +1.55% | 3.23% / 8.62% |
| Tritacale 50 g | 12.18 | +0.61<br>−0.30 | 0.29 / 2.38% | 13.17 | +0.53<br>−0.46 | 0.29 / 2.20% | 11.85 | +0.83<br>−0.58 | 0.42 / 3.54% | 12.78 | +0.44<br>−0.46 | 0.25 / 1.96% | −2.5% | +5.3% | −5.2% | +3.0% | 0.59 / 4.72% |
| Tritacale 150 g | 40.67 | +2.94<br>−2.96 | 1.85 / 4.55% | 38.02 | +3.07<br>−4.50 | 2.23 / 5.87% | 36.64 | +4.83<br>−3.55 | 2.42 / 6.60% | 34.45 | +2.53<br>−1.53 | 1.32 / 3.83% | +8.6% | +1.5% | −2.1% | −8.0% | 2.60 / 6.94% |
| Fertilizer 50 g | 12.57 | +0.51<br>−0.45 | 0.28 / 2.23% | 12.95 | +0.24<br>−0.30 | 0.19 / 1.45% | 11.97 | +0.43<br>−0.32 | 0.24 / 2.01% | 12.23 | +0.37<br>−0.33 | 0.20 / 1.64% | +1.13% | +4.18% | −3.7% | −0.8% | 0.42 / 3.38% |
| Fertilizer 100 g | 24.87 | +0.44<br>−0.87 | 0.38 / 1.53% | 25.84 | +0.67<br>−0.49 | 0.36 / 1.39% | 24.12 | +0.22<br>−0.14 | 0.20 / 0.8% | 24.88 | +0.66<br>−0.24 | 0.28 / 1.13% | −0.2% | +3.6% | −3.2% | −0.2% | 0.70 / 2.81% |
| Fertilizer 150 g | 36.70 | +0.50<br>−0.34 | 0.25 / 0.68% | 38.69 | +0.58<br>−0.63 | 0.45 / 1.16% | 36.24 | +0.37<br>−0.66 | 0.39 / 1.08% | 38.14 | +0.41<br>−0.46 | 0.28 / 0.70% | −3.10% | +0.60% | −3.21% | +2.14% | 1.16 / 3.10% |
| Rape 50 g | 12.40 | +0.37<br>−0.51 | 0.27 / 2.18% | 12.76 | +0.74<br>−0.70 | 0.36 / 2.82% | 12.40 | +0.42<br>−0.73 | 0.30 / 2.42% | 12.64 | +0.64<br>−0.82 | 0.35 / 2.77% | −1.20% | +1.67% | −1.20% | +0.72% | 0.18 / 1.43% |
| Soybeans 60 g | 14.21 | +0.81<br>−0.61 | 0.61 / 4.29% | 15.72 | +0.97<br>−1.41 | 0.86 / 5.47% | 14.57 | +1.53<br>−1.04 | 0.51 / 3.50 | 15.20 | +0.90<br>−0.84 | 0.58 / 3.82% | −4.82% | +5.29% | −2.41% | +1.81% | 0.67 / 4.49% |
| Tritacale 50 g 4.5 tip 1 and 3 high | 11.28 | +0.42<br>−0.35 | 0.25 / 2.22% | 14.11 | +0.60<br>−0.31 | 0.22 / 1.56% | 10.93 | +0.76<br>−0.40 | 0.31 / 2.84% | 13.69 | +0.25<br>−0.50 | 0.25 / 1.83% | −9.8% | +12.9% | −12.6% | +9.5% | 1.63 / 13.[illegible]4% |

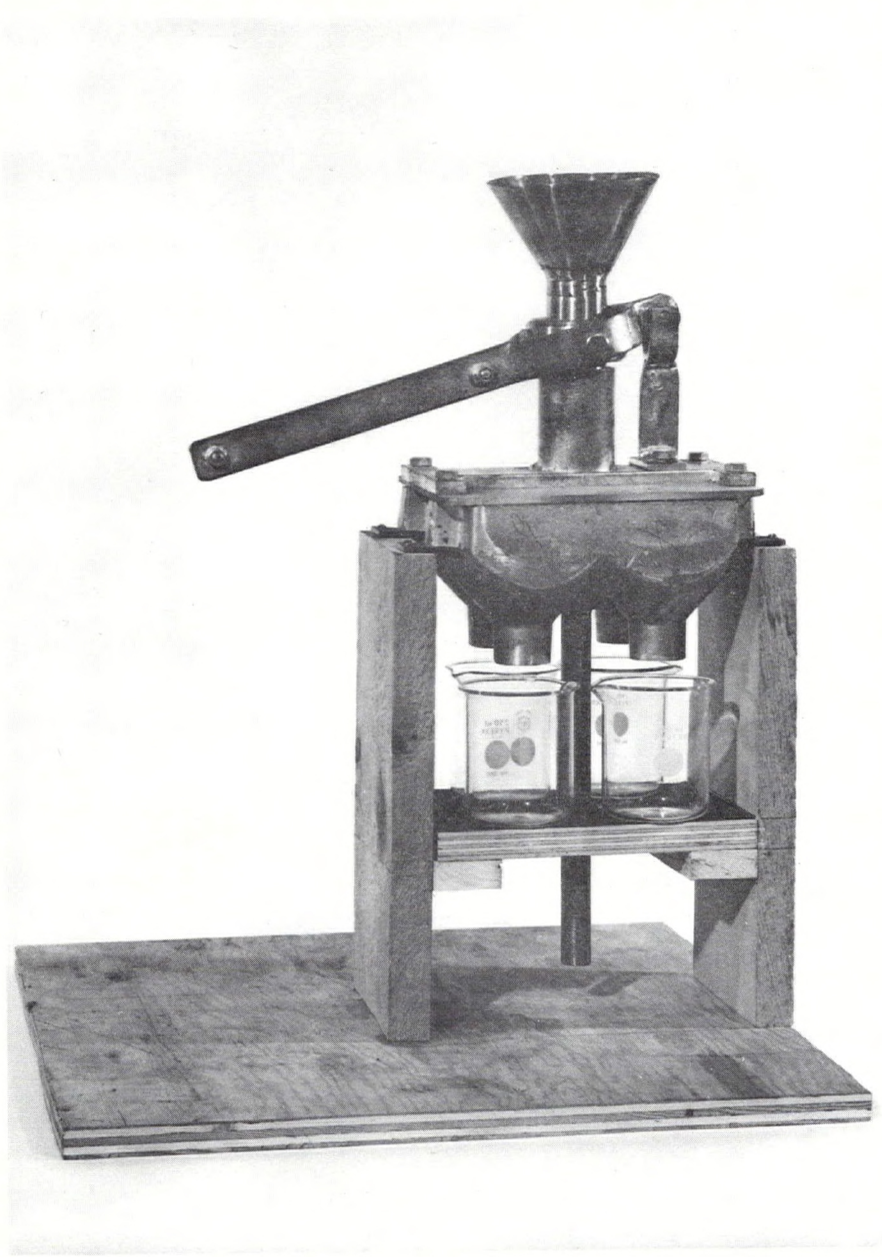

Figure 1. Craftsman 4-way divider mounted on a test stand.