Application Note 012: Study of measurement of Size and Colour of Oats

Introduction:

SeedCount has proven to be an excellent source of physical measurement on different types of seeds. The objective of this study is to test the instrument's feasibility to accurately measure physical characteristics, like size and colour, of oat seeds.

Procedure

10 samples containing around 100 seeds each were received from SARDI Oat Breeding, highlighting the different attributes they distinguish and categorise in their processes. Each sample has been described by the customer as follows:

- Sample 1: Large groats
- Sample 2: Different grain sizes
- Sample 3: Very small grains
- Sample 4: Dark creases
- Sample 5: Nice colours
- Sample 6: White colour
- Sample 7: Darker groats, some dark creases
- Sample 8: Small, fat and round
- Sample 9: Extra long groats
- Sample 10: Small, thin, brown, some ark creases

Each sample was analysed separately with the SeedCount instrument, using the wheat module due to the similarity between both as shown on figure 1.

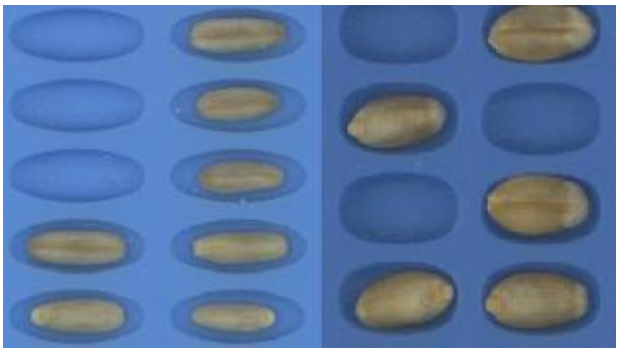

Figure 1 – Oats on the left and Wheat on the right side

Results:

Table 1 presents the size measurements obtained with the SeedCount instrument for each sample:

SampleID	Length Mean (mm)	Width Mean (mm)	Thickness Mean (mm)	Avg Seed Area (mm^2)
oat1	7.89	2.61	2.22	15.9
oat2	6.18	2.69	2.19	12.4
oat3	6.17	2.53	2.04	11.6
oat4	6.43	2.7	2.19	13.1
oat5	6.42	2.83	2.35	13.5
oat6	6.86	2.55	2.19	13.3
oat7	7.4	2.7	2.26	15.2
oat8	6.07	2.79	2.32	12.6
oat9	8.01	2.3	1.98	14.2
oat10	6.27	2.33	1.99	10.9

Table 2 shows the average colour of each sample expressed in CIELAB format.

SampleID	Avg CIE L	Avg CIE a	Avg CIE b
oat1	59	2	15.3
oat2	59.7	2.6	16.5
oat3	60.7	1.2	16.4
oat4	56.7	2	19.1
oat5	56.8	1.6	20.1
oat6	61.2	0	12.7
oat7	60.2	0.7	15.3
oat8	58.7	1.6	16.7
oat9	59.6	1.2	12.2
oat10	57.1	2.9	12.8

Discussion on Experiment 1:

A qualitative analysis was performed due to the absence of numeric data to compare with the obtained results. However, table 1 represents in numbers the description given by the customer.

1. Samples 1 and 9 showed the longest values, which were described as large groats and extra long groats respectively.
2. Samples 2, 3, 8 and 10 confirmed to contain the shortest sizes in length. However, samples 3 and 10 showed a lower average seed area and therefore the smallest kernels, as portrayed by the customer.
3. Sample 8 had the shortest length and one of the highest width and thickness, which verifies the status of small, thin and round.

Although the measurements made by SeedCount are more accurate than the ones made by humans, further studies can be performed to create a new module designed to measure oats and therefore achieve the accuracy of the instrument which is 0.08 mm.

The values expressed on table 2 represent a true average of the colour of the sample, i.e., the instrument measures the colour of each individual seed and therefore it is able to identify any physical abnormality or discoloration on a particular grain. However, in order to achieve this, we will require samples with these characteristics which will help us create an algorithm to identify them and the latter will be appended to the oats module.

Besides size and colour measurement, the instrument is able to identify creases and hence its brightness which can lead to the recognition of dark creases like the ones depicted on figure 2.

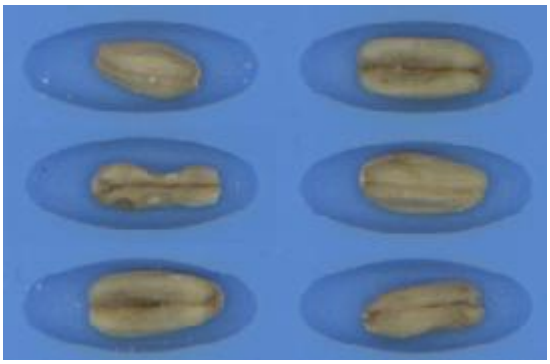

Figure 2 – Dark creases on sample 4

Conclusion

Despite the absence of numerical data to compare with the results obtained, the instrument produced consistent results with the provided description of the samples and therefore it is feasible to accurately measure oats with SeedCount.

A new module designed to measure oat seeds can be developed based on samples and reference values provided by the customer.