

Test of seed separation by farmscale equipment

Author(s): Lars Egelund Olsen

^a Landbrug & Fødevarer F.m.b.A., SEGES



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The test separation of mixed crops of barley & peas, wheat & lupin and oat & lentil was carried out in February and marts 2021. The test included two different types of mechanical solutions for cleaning and separation the mixtures and spectrum color sorter.

Summary

The test showed, that the barley & pea mixture together with the wheat & lupin mixture could be separated to a high degree, over 99 percent, using the rotating sieve cleaning unit which has a high capacity and relative low costs. However, even the small amount of cereals of barley or wheat will exclude, these pea and lupin fractions could be use into gluten free diets.

The separation of the oat & lentil mixture involved two steps. First a mechanical separation unit using sieves and indent cylinders followed by a spectrum color sorter. The first step upgraded the content of lentils from below 10 percent to more than 85 percent. The final step with the spectrum color sorter removed all cereals from the lentil fraction.

Separation equipment used

ROTATING SIEVE CLEANING WITH 3 DIFFERENT SIEVES AND AIR SUCTION

The rotating sieve cleaner was in this test used for separating the mixtures of barley & peas and wheat & lupin.

- Capacity: 3- 6 tons per hour.
- Low capacity with a high proportion of grain and high with a high proportion of legumes.
- Prize per tons of separated materiel: small quantities 10,7 € per ton and bigger quantities 4,0 € per ton.



Photo 1. Kongskilde rotating cleaner with 3 different sieves and air suction. The unit is fitted with a hopper on the lefthand side and two augers – one for each separated part. Photo: Visti Møller, Buurholt.

SIEVE CLEANING WITH 3 DIFFERENT SIEVES AND AIR SUCTION FOLLOWED BY TWO STEPS OF TWO DIFFERENT TYPES OF INDENT CYLINDERS

- Approximately capacity with the tested oat and lentil mixture: 2 – 300 kilos/hour.
- Approximately prize per kilo separated lentils: 0,40 – 0,52 €.



Photo 2. Mobile Sieve and indent cylinders separation and cleaning unit by Buurholt. Photo: Visti Møller, Buurholt.

SPECTRUM COLOR SORTER

- Approximately capacity: 100 kilos – 400 kilos per hour.
- Approximately prize per kilo separated lentils: 0,67 – 0,81 € per kilo if the lentils has been pre-separated with the sieve and indent cylinders separation unit.

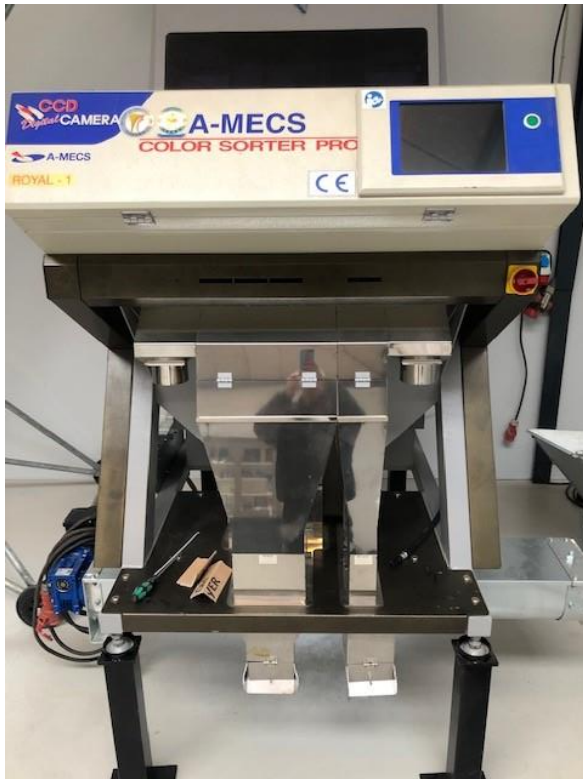


Photo 3. Spectrum color sorter. Photo: Visti Møller, Buurholt.

Grain and legume mixtures

1 to 3 tons of the following grain & legume mixtures was borrowed from local farmers and included in the test:

- Barley & peas
- Wheat & lupin
- Oat & lentil

Results

BARLEY & PEAS

The mixture of barley and peas was cleaned and separated using a rotating sieve cleaning with 3 different sieves and air suction. The raw material of this mixture consisted of 60,5 percent barley, 32,2 percent peas and a residue of 7,3. Se photo 4 and figure 1.



Photo 4. Raw material of the barley pea mixture consisting of 60,5 percent barley, 32,2 percent peas and a residue of 7,3. Photo: Lars Egelund Olsen, SEGES.



Photo 5. The separated pea fraction using the rotating sieve cleaning/separating unit consisting of more than 99 % barley. Photo: Lars Egelund Olsen, SEGES.

The capacity using the rotating sieve cleaning/separating unit was approximately 4 – 4,5 tons per hour due to the relative high content of barley.

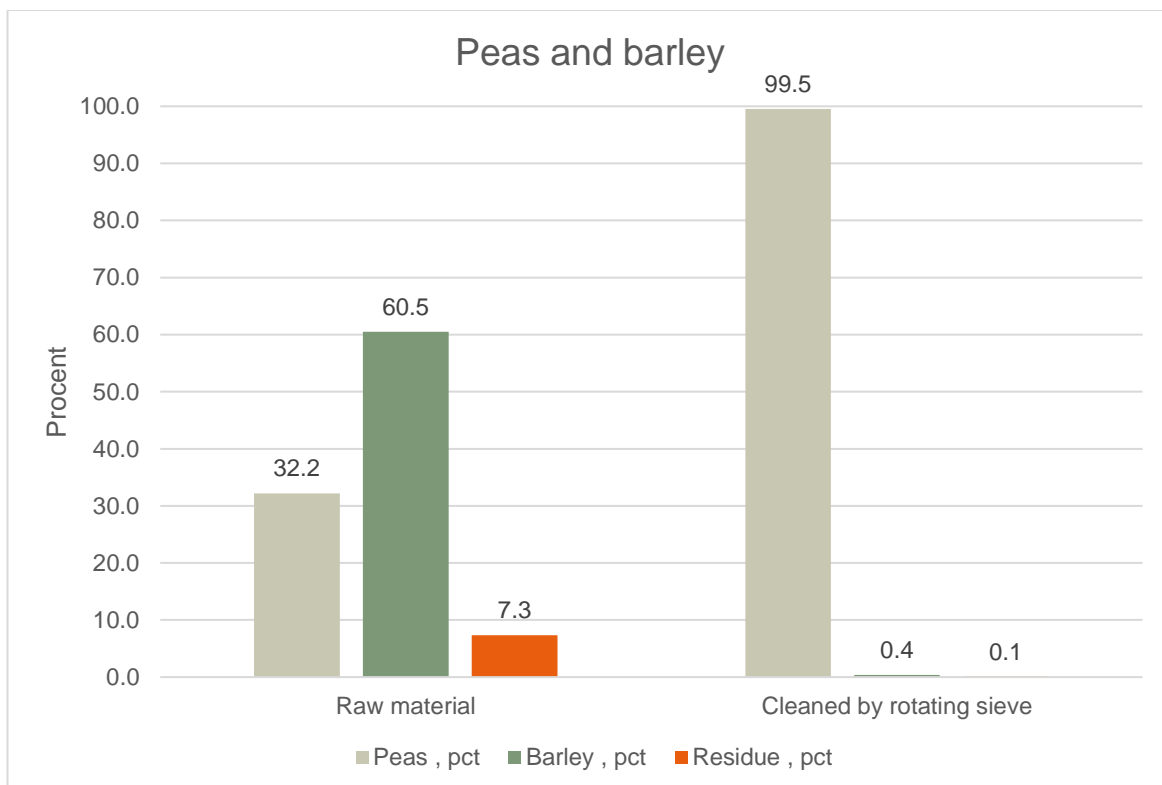


Figure 1. Testing the separation of the barley and pes mixture using a rotating sieve cleaning/separating resulted in a lupin fraction with 99,5 percent peas and 0,4 percent barley and 0,1 percent residue.

WHEAT AND LUPINS

The mixture of wheat and lupins was also cleaned and separated using a rotating sieve cleaning with 3 different sieves and air suction. The raw material of this mixture consisted of 54,5 percent lupins, 44,3 percent wheat and a residue of 1,2 percent. See photo 6 and figure 2.



Photo 6. Raw material of wheat and lupins with more than 50 percent lupin.

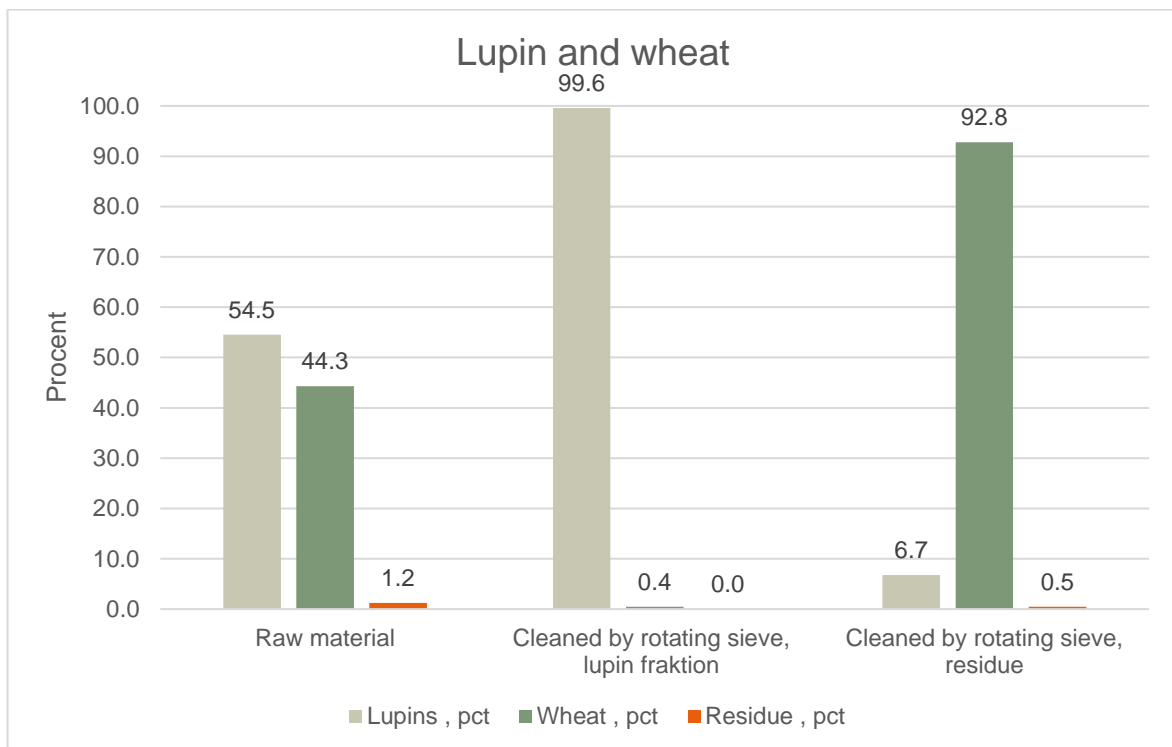


Figure 2. Testing the separation of the wheat and lupin mixture using a rotating sieve cleaning/separating.

Using the rotating sieve cleaning/separating unit resulted in a lupin fraction with 99,5 percent lupins, 0,4 percent wheat and 0,0 percent residue. The residue fraction of this separation consisted of 92,8 percent wheat, 6,7 percent lupins and 0,5 percent residue (weed, dust etc.), see figure 2. With an estimated capacity of 5-6 tons per hour a wheat and lupin mixture can be separated to a high degree with the rotating sieve cleaning/separating unit. However the fractions are not separated to a degree to be accepted into gluten free diets and in the residue fraction the content of lupin will unfortunately make the wheat unsuitable for making baking flour. A more likely use of the residue fraction will be high protein wheat for animal feed.

OAT AND LENTIL

This mixture was before the test estimated as the most difficult to separate successfully. The raw material of oat and lentils consisted of less than 10 percent and with more than 80 percent of oats. See photo 7.



Photo 7. Raw material of the oat and lentil mixture.

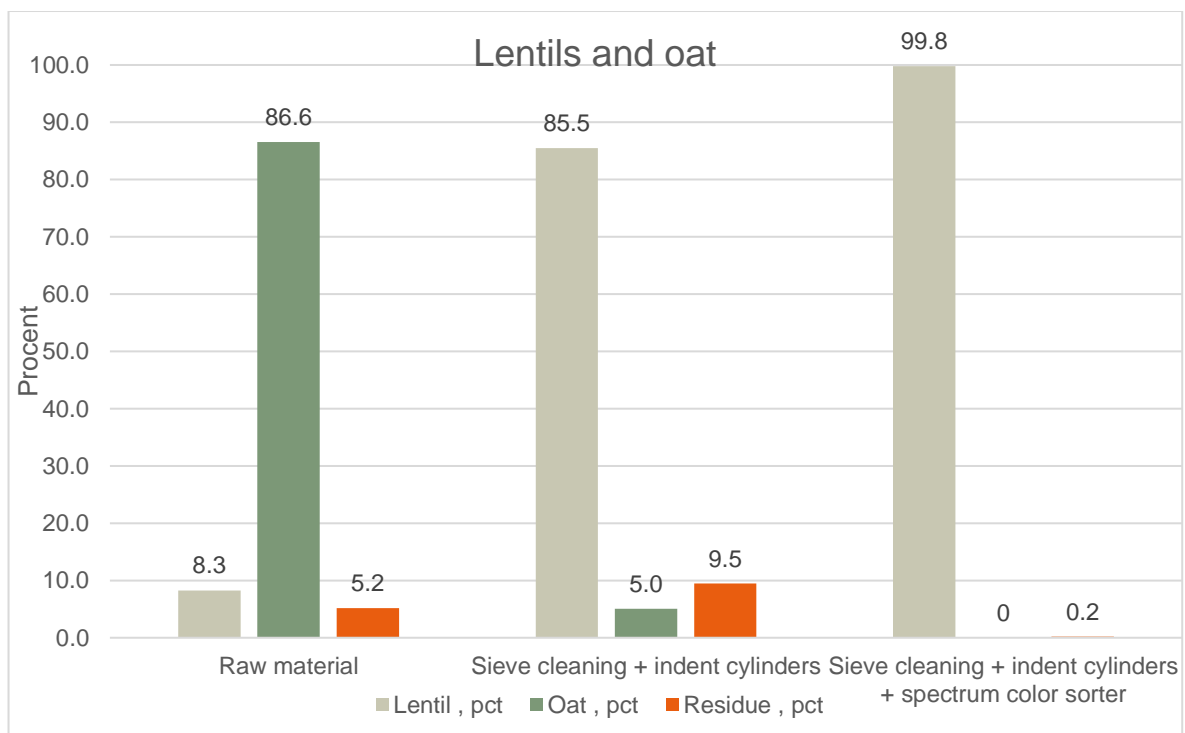


Figure 3. Test of separation of oat and lentil mixture by sieves, indent cylinders and a spectrum color sorter.

Separating the mixture of oat and lentil was challenging due to the relative low content of lentils in the mixture and due to the relative high content of weed compared to lentils. The first mechanical step of the separation with the sieves and indent cylinders resulted in a lentil fraction with 85,5 percent lentils, 5 percent oats and a relative high content of weeds ect. See photo 8 and figure 3. The final step in the separation of the mixture with the spectrum color sorter resulted in a nearly clean fraction of lentil with

only 0,2 percent of residue. The residue in the test sample consisted of seed of *Fallopia convolvulus*, which is a common weed in the organic fields see photo 9.



Photo 8. Mixture of oat and lentils after separation using sieves and indent cylinders. Photo: Lars Egelund Olsen, SEGES.



Photo 9. Mixture of oat and lentil after separation of both using sieves, indent cylinders and spectrum color sorter. This fraction had a content of 99,8 percent of lentils and 0,2 percent of residue (seed of *Fallopia convolvulus*) Photo: Lars Egelund Olsen, Landbrug & Fødevarer F.m.b.A., SEGES.