UPGRADED TECHNOLOGY FOR SUSTAINABLE SUNFLOWER MEAL PRODUCTION

UNAPREĐENA TEHNOLOGIJA ZA ODRŽIVU PROIZVODNJU SUNCOKRETOVE SAČME

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SUMMARY

Since the amount of hull reduces the nutritive value of sunflower meal proteins, the aim of this study was to investigate some of the possibilities for separating the hull and increasing the yield of protein fractions during the process of separation. The production parameters of the existing procedure without separation, procedure with centrifugal separation and the procedure with centrifugal separation of sunflower meal with preliminary treatments by crusher head (“Roscamp” type CHHD 36) were investigated. The preliminary treating was applied in order to crush the existing conglomerates and enable the subsequent separation of kernels from hulls adhered. Preliminary treating and latter centrifugal separation on screens with different openings (Ø 1.5, 1.8 and 2.0 mm) allow higher yield of high protein fractions by 24.0, 25.2 and 34.6% and only by 1.2, 1.4 and 1.7% respectively lower crude protein content. Compared to the existing processing procedures without separation, the procedures using centrifugal separation rendered the yield and quality of high protein fractions. According to the procedure with centrifugal separation, procedure using preliminary treatment by crusher head and centrifugal separation influenced the better yield of high protein sunflower meal but something less crude protein content. Produced high protein sunflower meals are comparable to adequate soybean products in chemical composition and in nutritional value and are suitable in feeding of younger and more sensitive animals.

Key words: sunflower meal, hull, separation, crusher head, sieving.

REZIME

Pošto količina ljuske smanjuje nutritivnu vrednost proteina suncokretove sačme, cilj ovog rada je bio da se ispitaju neke mogućnosti za izdvajanje ljuske i povećanje prinosa i kvaliteta proteinske frakcije u procesu separacije. Ispitivani su proizvodni parametri postojećeg procesa prerade suncokretove sačme centrifugalnom separacijom i procesa centrifugalne separacije nakon prethodne dorade na udarnoj drobilici (“Roscamp” tip CHHD 36). Prethodna dorada je preduzeta u nameri da se izdrobe prisutne grudve i da se omogući kasnije razdvajanje jezgra od slepljene ljuske. Preliminary treating and kasnije frakcionisanje na centrifugalnom separatorku na sitima sa različitim prečnicima otvora (Ø 1.5, 1.8 and 2.0 mm) omogućuju veći prinos visokoproteinske frakcije za 24.0, 25.2 i 34.6% uz samo 1.2, 1.4 i 1.7% niži sadržaj sirovih proteina. U poređenju sa postojećim procesom proizvodnje bez separacije, procesom sa centrifugalnom separacijom povećava se prinos i kvalitet visokoproteinske frakcije. U odnosu na postupak sa centrifugalnom separacijom, proces koji koristi udarnu drobilicu i centrifugalnu separaciju utiče na bolji prinos visokoproteinske suncokretove sačme ali uz nešto manji sadržaj sirovih proteina. Proizvedene visokoproteinske suncokretove sačme su uporedljive sa odgovarajućim proizvodima od soje po hemijskom sastavu i nutritivnoj vrednosti i pogodne su za ishranu mladih i osećljivijih životinja.

Ključne reči: suncokretova sačma, ljuska, separacija, udarna drobilica, prosežavanje.
tions for yield increase and enhancing the quality of decellulosed high protein sunflower meal.

The separation of sunflower hulls from kernels with centrifugal separator is rather heavy due to the presence of hard conglomerates made of kernels and hulls adhered to them. The remarkable amount of these conglomerates flow over the sieve holes and directly reduced protein fraction yield (Lević, J. et al 1998). The preliminary treating was applied in order to crush the existing agglomerates and enable the subsequent separation of kernels from hulls adhered. It is very important that hulls are not crushed into too small particles so that it could be separated later by mechanical fractionation. The production parameters of this existing procedure of sunflower meal fractionation in the centrifugal separator and the procedure of centrifugal separation after preliminary treatment with crusher head were investigated. The aim of current investigation was to increase the yield of high protein sunflower meal with the lowest possible increase of crude fiber content.

MATERIAL AND METHODS

The production parameters and the efficiency of the existing procedure for centrifugal separation of sunflower meal and the procedure for centrifugal separation after preliminary treatment with crusher head were investigated.

Working scheme of centrifugal separator is shown at fig. 1. and its characteristics were as follows:
- Producer – “Zmaj”, Zemun
- Type of equipment – 218-SS-I
- Power 5.5kW
- Sieve openings – Ø = 1.5; 1.8; 2.0 and 2.2 mm
- Screen area - 0.6m² (93 x 46 cm)

![Image of centrifugal separator](image1.png)

**Fig. 1. Working scheme of centrifugal separator**
1-Bin; 2-Sieve; 3-Rotor; 4-Cellulosic fraction-overs; 5-Protein fraction-through

**Table 1.** Content of crude proteins and crude cellulose in throughs, and yield of throughs after centrifugal separation of sunflower meal without, and after preliminary treatment on crusher head

<table>
<thead>
<tr>
<th>Sieve opening on centrifugal separator [mm]</th>
<th>Yield of through without pre-treatment [%]</th>
<th>Yield of through after pre-treatment [%]</th>
<th>Crude protein without pre-treatment [%]</th>
<th>Crude protein after pre-treatment [%]</th>
<th>Crude fiber without pre-treatment [%]</th>
<th>Crude fiber after pre-treatment [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>44.2</td>
<td>54.8</td>
<td>44.3</td>
<td>43.1</td>
<td>10.7</td>
<td>11.4</td>
</tr>
<tr>
<td>1.8</td>
<td>46.5</td>
<td>58.2</td>
<td>43.7</td>
<td>42.3</td>
<td>11.1</td>
<td>11.9</td>
</tr>
<tr>
<td>2.0</td>
<td>50.8</td>
<td>68.4</td>
<td>41.8</td>
<td>40.1</td>
<td>12.8</td>
<td>13.9</td>
</tr>
</tbody>
</table>

It can be noticed (Table 1.) that process of centrifugal separation on sieves with different sieve openings (Ø = 1.5; 1.8 and 2.0 mm) without and after pretreatment by crusher head.

Initial sunflower meal used in experiments were produced from domestic oil-type seeds and it contained about 38.5 % crude protein and 19.4 % crude fiber.

The contents of crude protein and crude fiber of all samples and chemical composition of average optimal samples obtained were determined in accordance with AOAC methods (1984).

RESULTS AND DISCUSSION

The results of fractionation process of sunflower meal with and without preliminary treatment on crusher head are shown in Table 1. Process was performed on centrifugal separator by sieves, with followed dimension of openings: 1.5, 1.8 and 2.0 mm.

![Image of crusher head](image2.png)

**Fig. 2. Crusher head**

It can be noticed (Table 1.) that process of centrifugal separation on sieves with different sieve openings (Ø = 1.5; 1.8 and 2.0 mm), after preliminary treatment gives high protein sun-
flower meal of extremely good quality, as throughs in amount of 54.8, 58.2 and 68.4% of initial meal. Therefore, additional treatment of sunflower meal on crusher head gives higher yield of throughs for 24.0, 25.2 and 34.6% and lower content of crude proteins for only 1.2, 1.4 and 1.7% of absolute value. It is obvious from the content of crude cellulose (11.4, 11.8 and 13.9%) in these throughs separated after preliminary treatment on crusher head and from difference of only 0.7, 0.8 and 1.1% of absolute value between content of crude cellulose in products gained with and without preliminary treatment, that there is no undesirable redundant crushing of sunflower hull contained in initial sunflower meal. Throughs, gained by centrifugal separation on sieves with openings of 1.5 and 1.8 mm after preliminary treatment by crusher head satisfied demands for 1st quality of sunflower meal. Throughs, gained by centrifugal separation on redundent crushing of sunflower hull contained in initial sunflower meal, represents a high valuable sustainable products suitable for feeding young and sensitive animals.

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REFERENCES


CONCLUSION

Preliminary treating by crusher head and later centrifugal separation on different screens allow the yield of 54.8-68.4% of sunflower meal fractions with high protein (43.1-41.8%) and low fiber content (11.40-13.9%). These upgraded decellulosed sunflower meals represents a high valuable sustainable products suitable for feeding young and sensitive animals.