

**EXTRUDED CORN AND BARLEY IN NUTRITION OF PIGLETS****Branislav Živković<sup>1</sup>, Goce Cilev<sup>2</sup>, Olga Kosovac<sup>1</sup>, Čedomir Radović<sup>1</sup>,  
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The effects of the use of extruded corn and barley as a partial 50% replacement of corn in the nutrition of suckling piglets and weaned pigs are investigated. Investigated feedstuffs were produced according to specific technology in the company “Halas Jožef”, Ada. Research was carried out on the private pig farm in the same company. Obtained results showed that in the isoenergy and the isonitrogen mixtures containing 22% crude protein. Introduction of investigated extruded feedstuffs had positive effects exhibited in increase by 2.77% of total litter mass of suckling piglets at weaning and lower feed consumption by average 10.94% during creep feeding of piglets, during the lactation period. During weaning period, the experimental group of animals fed the extruded corn and barley in the starter mixture containing 20% crude protein, realized better the gain by 3.28% and better feed conversion ratio by 2.21% in weaned piglets. In general, the obtained results showed that the use of extruded corn and barley as partial substitution of corn in diets can be recommended in the nutrition of both suckling piglets and weaned pigs.

**Key words:** extruded corn; extruded barley; suckling piglets; weaned pigs

**ЕКСТРУДИРАНИ ПЧЕНКА И ЈАЧМЕН ВО ИСХРАНАТА НА ПРАСИЊА**

Беа истражувани ефектите од употребата на екструдирани пченка и јачмен како 50% замена на пченката во исхраната на дојни и одбиени прасиња. Користените крми беа произведени со специјална технологија во компанијата „Halas Jožef“ во Ада. Истражувањата беа изведени на приватна свињарска фарма на истата компанија. Добиените резултати покажаа дека изоенергетски и изоазотни смески содржат 22% суров протеин. Воведувањето на истражуваните екструдирани крми имаше позитивен ефект прикажан преку зголемување за 2,77% на вкупната маса на леглото на дојните прасиња при одбивање и помала консумација на храна во просек за 10,94% во време на течна исхрана на прасињата во лактациониот период.

Во периодот на одбивање експерименталните животни беа хранети со екструдирани пченка и јачмен во starter смеска со содржина од 20% сурови протеини. Кај одбиените прасиња беше реализиран подобар прираст за 3,28%, додека конверзијата на храна беше подобра за 2,21%.

Генерално, добиените резултати покажуваат дека екструдирани пченка и јачмен како парцијална замена на пченката во оброците можат да бидат препорачани за исхрана на дојни и одбиени прасиња.

**Клучни зборови:** екстудирана пченка; екстудирани јачмен; дојни прасиња; одбиени прасиња

**1. INTRODUCTION**

In Serbia, most of pigs are fed the diets based on corn and soybean oil meal. As partial substitutes of corn other cereals can be used such as bar-

ley, wheat, triticale, etc. In spite of moderate cellulose content (e.g. 5–10% NDF), in the mixtures, approx. 70% of cellulose components can be attributed to corn. Since these cellulose components have a decisive role in digestibility in ileum (Moe-

ser et al., 2002), processing of corn for the purpose of reduction of cellulose and rational the starch degradation is one of the ways to improve its nutritive value.

The objective of this paper was to extrude corn and barley as main cereals in mixtures for suckling piglets and weaned pigs for the purpose of improvement of the nutritive value of mixtures and the production performance of piglets.

## 2. MATERIAL AND METHODS

Investigations were carried out on the pig farm of the company PD »Halas Jožef« in Ada, Serbia. In two experiments the total of 295 piglets crosses of Large Yorkshire × Swedish Landrace were used, born of 2 × 12 litters.

The trial was formed immediately before farrowing when the sows were divided into two nutrition treatments. Piglets of the first, control, group were fed mixture containing non-extruded corn and barley, and the animals of the second, trial, group were fed mixtures where the half of the quantity of corn and barley used in the control group was substituted with extruded corn and barley. Extruding of both cereals was done in the production facility of »Halas Jožef«, at temperature of approx. 118°C.

As criteria for assessment of obtained results the following indicators were used: number of born piglets, piglet losses during the suckling period, number of weaned piglets, average mass of piglets at birth and weaning, average daily gain during lactation and consumption of pre-starter during creep feeding.

At weaning, piglet groups were formed, taking into consideration that piglets fed non-extruded cereals in lactation are fed the same mixture, and that the experimental group piglets are fed the same mixture where half of the corn and barley used in the control group is substituted with extruded forms of these cereals.

In the weaning period of piglets following indicators were recorded: average daily gain, average daily consumption and feed conversion ratio.

The statistical processing of data – body masses, gain and consumption of pre-starter, was done by using conventional methods of statistical processing, variance analysis and data on differences between average values using t-test.

## 3. RESULTS AND DISCUSSION

In trials the possibility for introduction of extruded corn and barley into the nutrition of suckling piglets and weaned piglets was investigated.

Obtained results (Tab. 1) showed that the trial group, fed extruded cereals, realized higher total body mass of litter by average 23.2 kg or 2.77% at weaning compared to the control group of piglets fed mixture with non-extruded cereals.

For realization of almost the same gain, the trial piglets consumed 1.4 kg or 10.94% less pre-starter per litter compared to the control group.

During the rearing period, partial substitution of non-extruded corn and barley with extruded forms caused increase of gain in average 10 g or 3.28% compared to the group fed mixture with non-extruded cereals (Tab. 2).

There was no significant difference in feed intake between the investigated groups of piglets.

Piglets fed diet with extruded cereals consumed 0.04 kg or 2.21% less food for 1 kg of gain in comparison to the control group of animals.

Extruding corn can influence the taste and smell of food (Mercier, 1980; Bjorck et al., 1985) and in this way it improves the digestibility of dry matter of corn in small intestines of piglets by 5.9% (Muley et al., 2007), i.e. significantly improves digestibility of N and energy (Lv et al., 2006). Extruding of corn improved feed conversion ratio, reduced true fecal digestibilities of lysine and methionine (Chae et al., 2000). Extruding of corn and soy bean by production of so called Amiloproteks had a positive effect on production of weaned piglets (Kovčín et al., 1991). At the highest level of inclusion of extruded barley, the best performance parameters were achieved (Cheftel, 1986). In vitro extruding causes increase of digestibility of starch from 20% to 90% (Van der Poel et al., 1990).

In piglets in the phase 1, performance parameters were better for the animals which consumed extruded corn (Van der Poel et al., 1989; Richert et al., 1992). Different reasons of improved the nutritive value of extruded corn can be considered including altered microstructure (Ghorpade et al., 1997), starch gelatinization (Lue et al., 1991), reduced resistant starch content (Muray et al., 2001), reduced starch protein complexes (Herkelman et al., 1990; Hongtrakul et al., 1998) and rupture of oil cells that may improve the availability of oils for digestion (Hull et al., 1968).

Table 1

*Performance of suckling piglets in the experiment*

	Group 1 (control)	Group 2 (experimental)
<b>Suckling piglets</b>		
<i>Corn and barley were non-extruded</i>	+	–
<i>Extruded corn and barley</i>	–	+
Duration of lactation, days	29.4	29.0
Number of liveborn piglets/litter	12.27	12.45
Number of equalized piglets/litter*	10.45	11.91
Number of weaned piglets/litter	9.82	10.54
Average body weight at farrowing, kg	1.45	1.21
In the comparison at 1 <sup>st</sup> group, %	–	– 16.55
Average bodyweight at weaning, kg	7.75	7.42
In the comparison at 1 <sup>st</sup> group, %	–	– 4.26
Average body weight of litter at weaning, kg	76.1	78.3
In the comparison at 1 <sup>st</sup> group, %	–	+ 2.89
Total live weight of litters at weaning, kg	837.1	860.3
In the comparison at 1 <sup>st</sup> group, %	–	+ 2.77
Average daily gaining of suckling piglets, g	216	213
In the comparison at 1 <sup>st</sup> group, %	–	– 1.39
Consumed of prestarter/litter, kg	12.8	11.4
In the comparison at 1 <sup>st</sup> group, %	–	– 10.94

\*Equalization of suckling piglets includes the imputation of piglets from litter to litter inside the group after the colostrum consumed.

Table 2

*Performance of weaned pigs in the experiment*

	Group 1 (control)	Group 2 (experimental)
<b>Weaned pigs in the experiment, 8 – 28 kg</b>		
<i>Corn and barley were non-extruded</i>	+	–
<i>Extruded corn and barley</i>	–	+
Body weight of weaned pigs at the beginning of experiment, kg	8.39	8.44
Body weight of weaned pigs at the end of experiment, kg	27.65	28.28
Duration of experiment, days	63	63
Average daily gain, g	305	315
In the comparison at 1 <sup>st</sup> group, %	–	+ 3.28
Average daily feed intake, kg	0.554	0.558
In the comparison at 1 <sup>st</sup> group, %	–	+ 0.72
Feed conversion ratio, kg	1.81	1.77
In the comparison at 1 <sup>st</sup> group, %	–	+ 2.21

Results indicated higher bulk density of extruded corn which is associated with improved growth performances in the pigs and this appears to be associated with increased viscosity and

transit time (Amornthewaphat and Attamangkune, 2008). Heat treated cereals can be used in piglet nutrition in initial mixtures up to 40% and up to 20% in final mixtures (Kovačević, 2007).

In general, obtained results have shown that by extruding cereals production performance of suckling piglets and weaned piglets has improved.

#### 4. CONCLUSION

The effects of the use of extruded corn and barley as a partial 50% replacement of corn in the nutrition of suckling piglets and weaned pigs are investigated.

Investigated feedstuffs were produced according to specific technology in the company "Halas Jožef", Ada, Serbia.

The research was carried out on the private pig farm in the same company.

The obtained results showed that in the iso-energy and the iso-nitrogen mixtures containing 22% crude protein, introduction of investigated extruded feedstuffs had positive effects exhibited in increase by 2.77% of the total litter mass of suckling piglets at weaning and lower feed consumption by average of 10.94% during creep feeding of piglets, during the lactation period.

During the weaning period, the experimental group of animals fed the extruded corn and barley in the starter mixture containing 20% crude protein, realized better the gain by 3.28% and better feed conversion ratio by 2.21% in the weaned piglets.

In general, the obtained results showed that the use of extruded corn and barley as partial substitution of corn in diets can be recommended in the nutrition of both suckling piglets and weaned pigs.

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