



Nutritive value of full-fat rapeseeds for growing pigs

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Abstract. The digestibility and nutritive value of full-fat, ground rapeseeds of two low-erucic acid, low-glucosinolate varieties, Candle (*Brassica campestris*) and Regent (*B. napus*), were determined for three pigs, weighing about 40 kg each. The ME values were 18.72 and 20.26 MJ ME/kg DM, the NE values 1.58 and 1.70 FU/kg DM (FU = 0.7 kg starch) and the DCP values 155 and 201 g DCP/kg DM, respectively, for the two varieties. Nitrogen balances in the same trials were 21.0 and 22.0 g N/d.

Twenty-eight freshly weaned piglets averaging 11 kg in weight were fed during four weeks 1) a control diet containing barley and skim milk powder, or 2) the control diet with 10 % finely ground Candle seeds incorporated. The calculated energy and DCP values of the diets were alike. The growth rates of both groups were equal, as were the palatabilities of the diets. The feed conversion figures were 2.0 and 2.1 FU/kg liveweight gain, respectively. Accordingly, the energy value of Candle seeds was a little poorer for piglets than for the older growing pigs.

Introduction

Rapeseeds are usually cultivated for the food oil industry and only the defatted meal is used for animals. The whole seeds can also be fed to animals, of course. Low-erucic acid, low-glucosinolate rapeseeds have been successfully included at 10 % level in the diets of laying hens, from 10 to 20 % in the diets of broiler chickens (LEESON et al. 1978) and up to 21.5 % in the diets of turkeys (MOODY et al. 1978). High-glucosinolate seeds, however, have decreased the production of poultry at the 10-20 % inclusion level (WOODLY et al. 1972, OLOMY et al. 1975 a, 1975 b). Low-glucosinolate seeds have proved to be a useful protein and energy source also in lamb milk replacers (SEOANE et al. 1976), and have been found to improve the milk production of dairy cows (ANON. 1978).

In the present study the full-fat ground rapeseeds of low-erucic acid, low-glucosinolate varieties, Candle (*Brassica campestris*) and Regent (*B. napus*), were investigated as feeds for pigs. In the first trial the digestibility and nutritive value of the seeds was determined for growing pigs. In the second trial freshly weaned piglets were fed diet containing 10 % Candle rapeseeds.

1. Digestibility and feed value of seeds

Materials and methods

The diets contained 20 % of milled rapeseeds, barley as a basic component, and skim milk powder sufficient to bring the crude protein content to 120 g DCP/FU. Minerals and vitamins were incorporated in the diets at standard levels. The composition of the rapeseeds is set out in Table 1.

Table 1. Composition of rapeseeds, % of dry matter.

	Candle	Regent
Crude protein	22.5	25.0
Crude fat	44.9	45.1
Crude fibre	7.6	7.1
Ash	5.3	5.0
NFE	19.7	17.8
Glucosinolates	0.32	0.45
Tannins	1.10	0.88

The digestibility trials were performed with three castrated pigs weighing about 40 kg. The pigs were kept in digestibility cages in a room maintained at 13–18° C. A vermicide was given to the animals at the beginning of the trial.

The daily ration of 1.6 FU was given as two meals. Barley, rapeseeds skim milk powder, and mineral and vitamin mixtures were weighed separately, and given mixed with two volumes of water. The pigs ate the ration immediately and were then offered water.

The preliminary period was 15 days, and the collection period 5 days. The faeces and urine were collected in the morning and samples of fixed amount were taken for analysis. Sulphuric acid was added to the urine collection pail to keep the acidity under pH 3. At the end of period splatterings of feed were collected from a plastic sheet placed in front of the trough, and subtracted from the total amount of feed given.

The dry matter determinations were made at 103° C, and the samples for analysis dried in vacuum at 50° C. Feeds and faeces were milled with a sieve of 0.5 mm.

The feed analyses were performed according to standard procedures. The determinations of glucosinolates and tannins were made at the State Institute of Agricultural Chemistry.

The digestibility of the barley meal was determined in a separate trial and the digestibility coefficients for skim milk powder were taken from Feed Tables (ERIKSSON et al. 1972). The digestibility of rapeseeds was then calculated by subtraction.

The metabolizable energy and net energy values were calculated using factors and models of NJF's Feed Tables (ANON. 1969).

Results and discussion

The digestibility coefficients and calculated energy and DCP values are presented in Tables 2 and 3.

Table 2. Digestibility coefficients of rapeseeds.

	Candle	Regent
Organic matter	74.4	81.0
Crude protein	68.9	80.5
Crude fat	79.6	83.1
Crude fibre	38.2	53.7
NFE	63.3	66.0

Table 3. Nutritive value of rapeseeds.

	Candle	Regent
Metabolizable energy, MJ/kg DM	18.72	20.26
Net energy, FU/kg DM ¹⁾	1.58	1.70
Digestible crude protein, g/kg DM	155	201

¹⁾ FU = 0.7 kg starch.

Information about nutritive value of full-fat rapeseeds for pigs is scant. The only figure found was the ME value of 21.1 MJ/kg DM in the Feed Tables of the DDR (NEHRING et al. 1970), which is slightly higher than the value here for the Regent seeds. The difference may be due to the fact that the present seeds were ground fairly coarsely, some whole seeds being visible in the meal. (A separate trial revealed that the pig is unable to digest unmilled rapeseeds.) However, high variation in rape varieties or seed batches seems to occur. For instance, the Swedish Feed Tables give a ME value of 5.11 Mcal/kg DM for ruminants (ERIKSSON et al. 1972), and the Norwegian Tables 4.41 Mcal/kg DM (BREIREM & HOMB 1970).

In the present study the Regent seeds (*R. napus*) were found to be a little better in nutritive value than the Candle seeds (*B. campestris*) (Tables 2 and 3). SIBBALD and PRICE (1977) have reported an even larger average difference between *B. napus* and *B. campestris* seeds (5.08/4.52 Mcal ME/kg DM for poultry). The Candle variety, however, has a thinner seed coat than the older varieties and thus a better energy value. MUTZTAR et al. (1978) have found its AME value to be similar to that of Tower for poultry (4.4/4.5 Mcal, respectively).

The nitrogen balances for Candle and Regent seeds were alike, 21.0 and 22.0 g N/d, respectively. The protein of the seeds constituted only about 25 % of the protein content of the rations, however.

The FU value of full-fat rapeseeds for growing pigs proved to be about one and a half times, and the DCP value/kg DM almost two times the value

of barley. An additional advantage of the rape seeds compared with barley is the better amino acid composition and higher linolic acid content (see NEHRING et. al 1970.) From the cost point of view, however, barley is a better feedstuff than the rapeseeds.

2. Rapeseeds as feed for freshly weaned pigs

Materials and methods

To obtain further information on the value of rapeseeds, a four-week growth trial was conducted with 28 freshly weaned pigs. The piglets were chosen because with older pigs the high oil content of the diet is reflected in lowered quality of the carcass.

The age of the pigs at the beginning of the trial was from 4.5 to 6 weeks and the average weight 11.1 kg. The pigs were given a vermicide and divided according to weight, age and sex into two equal groups, each of which was further divided and placed into two pens according to weight. The weight gain of pigs was followed individually and their feed consumption per pen.

The ration of the control group consisted of barley, skim milk powder, minerals and vitamins. The experimental diet differed from the control ration only in a 10 % rapeseed content; proportions of barley and skim milk powder were reduced so that the crude protein contents of the diets equal (Table 4). The rapeseeds were ground together with barley using a 2 mm sieve. The milling was successful and no whole seeds were detected in the meal.

The feeds were given as two meals daily, mixed with warm water. Between meals the dry meal was put in the troughs.

Table 4. Composition and nutritive value of the diets of the piglets.

	Experimental group	Control group
Dry matter, %	91.0	91.0
<i>% of dry matter</i>		
Crude protein	22.0	21.9
Crude fat	5.7	1.4
Crude fibre	4.0	3.4
Ash	5.9	6.2
NFE	62.4	67.1
NE value, FU/kg DM	1.19 ¹⁾	1.15
DCP value, g/kg DM	195 ¹⁾	200

¹⁾ Calculated using rapeseeds feed values as presented in Table 3.

Results and discussion

The pigs were weighed twice at the beginning and end of the trial and twice during the trial. The growth rates of the two groups were very alike, the average daily gain being 485 g for experimental group and 487 g for control

group (Fig. 1). The palatability of the experimental feed was better than the control feed in the dry form, but when mixed with water no difference was found. No sickness was recorded during the trial.

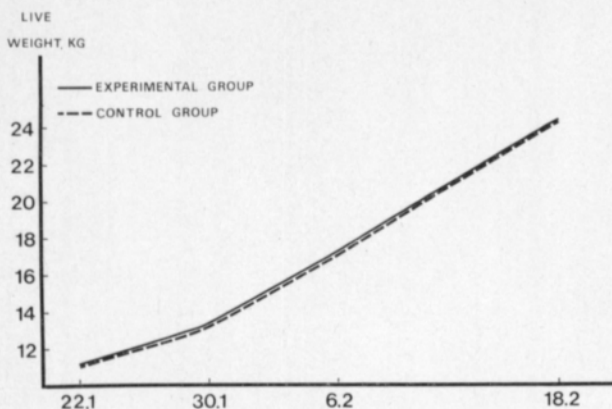


Fig. 1. Growth rates of the piglets.

The consumption of feed was also almost equal. The average daily intakes were 921 g and 902 g for the experimental and control groups, respectively. The utilization of feed was a little better in the control group: an average of 2.0 FU/kg liveweight gain against 2.1 FU/kg in the experimental group. The energy value of the experimental diet thus proved to be a little lower than the value calculated for the 40-kg pigs (Table 4). The 10–25 kg piglets thus utilized the rapeseeds somewhat less efficiently, despite the fact that the rapeseeds fed to piglets were ground much more finely than those used in the digestibility trial.

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SELOSTUS

Rypsin- ja rapsinsiementen rehuarvo lihasioilla

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Niukasti erukahappoa ja glukosinolaatteja sisältävien jauhettujen Candle-rypsin (*Brassica campestris*) ja Regent-rapsin (*B. napus*) sulavuus ja rehuarvo määritettiin kolmella noin 40 kg painoisella lihasioilla. Muuntokelpoisen energian arvoksi saatiin 18.72 ja 20.26 MJ/kg ka, nettoenergia-arvoksi 1.58 ja 1.70 ry/kg ka sekä valkuaisarvoksi 155 ja 201 g srv/ka ka. Typpitaseet olivat 21.0 ja 22.0 g N/pv.

28 äsken vieroitettua, keskimäärin 11 kg painoista porsasta oli neljän viikon ajan ruokintakokeessa, jossa puolet porsaista sai ohrasta ja rehumaitojauheesta koostuvaa vertailuseosta, toinen puoli koeseosta, mikä sisälsi 10 % hienoksi jauhettua Candle-rypsyä. Ohraa ja rehumaitojauhetta oli koeseoksesta vähennetty siten, että lasketut energia- ja valkuaisarvot olivat lähes samat. Ryhmien kasvu oli täysin samanlaista, koeryhmän porsaiden keskimäärin 485 g, vertailuryhmän 487/pv. Rehuseosten maittavuudessa ei ollut eroa. Rehun hyväksikäyttö oli koeryhmillä 2.1 ry ja vertailuryhmällä 2.0 ry/lisäkasvukilo. Tämän mukaan 10—25-kiloiset porsaas käyttivät rypsin siemeniä hyväkseen vähän huonommin kuin 40-kiloiset lihasiat.