



The use of rye in feed

Introduction

For centuries, rye has been cultivated as a bread grain, especially on poorer soils, in central and northern Europe. Although this grain species was and still is used for feeding in the typical rye growing areas, its use as a feed grain has gained only limited importance. Only every so often rye is also grown as a green grain in form of a winter catch crop or stubble seed and freshly fed to ruminants.

Decisive for the still existing reservations of using rye as a feed grain are former studies showing a lesser feed intake, stiff bones and an impairment of the excrement consistence when using high rye proportions in the ration.

This impact is linked with higher contents of anti-nutritive substances, such as non-starch polysaccharides (pentosans, beta glucane and pectins) and bitter substances.

However, two important elements for the use of rye in feed have changed over the last years. On the one hand bitter substances and alkylresorcinols play a minor role in today's varieties thus enhancing the suitability of rye as feed and on the other hand rye intervention has been stopped within the EU Grain Market, which resulted in a higher price fluctuation making the use of rye for feed mixes at times economically very attractive.

What makes rye good value for money, however, does not only depend on the current grain prices but also on the available quality.

1. Components and feed value

With regard to feed value rye is normally ranged between wheat/triticale and barley. The means in survey 1 are a point of reference.

Survey 1: Analysed raw nutrient contents and derived energy and amino acid contents of rye in comparison with wheat, triticale and barley (means and standard deviations, data related to 88 % dry matter; NIRS analyses, means from several harvest years, LUFA Nord-West (*State Agricultural Testing and Research Institute*), 2003)

	Rye n = 247	Wheat n = 711	Triticale n = 386	Barley n = 800
Dry substance ¹⁾ %	87.1 1.6	87.3 1.5	86.9 1.5	86.8 1.5
Crude protein %	8.5 1.2	11.9 1.4	11.1 1.6	11.7 1.4
Raw fat %	1.8 0.14	2.2 0.16	2.2 0.20	2.8 0.15
Raw fibre %	2.1 0.33	2.5 0.15	2.5 0.27	4.9 0.57
Starch %	54.5 1.3	59.3 1.2	58.7 2.1	50.3 1.7
ME pig ²⁾ MJ/kg	13.5 0.14	14.3 0.16	14.2 0.14	13.0 0.21
ME cattle MJ/kg	11.7 0.03	11.8 0.02	11.6 0.03	11.4 0.11
NEL MJ/kg	7.4 0.04	7.5 0.01	7.3 0.03	7.2 0.06
nXP g/kg	144 1.3	151 2.5	146 1.9	147 3.5
RNB g/kg	-9.5 1.7	-5.1 1.8	-5.5 2.3	-4.9 1.7
Lysine ³⁾ %	0.32 0.04	0.31 0.02	0.35 0.04	0.38 0.03
Methionine/Cysteine ³⁾ %	0.33 0.04	0.51 0.04	0.43 0.05	0.43 0.04
Threonine ³⁾ %	0.28 0.04	0.33 0.03	0.34 0.05	0.38 0.04
Tryptophan ³⁾ %	0.09 0.01	0.14 0.01	0.11 0.01	0.14 0.01

1) referred to the original substance

2) calculated with ME feed compound formula

3) calculated with Degussa regression equation

(n = number of samples taken, nXP = utilizable crude protein, RNB = Nitrogen balance and ruminal parameters)

The copper contents of grain range between 2 to 5 mg/kg and the zinc contents between 25 to 50 mg/kg.

With reference to the original substance rye has a more lower, but with reference to the crude protein the highest lysine content. Out of the four grain species rye has the lowest precaecal digestibility of threonine and tryptophan. Even the precaecal digestibility of lysine and methionine is lower in rye than in wheat and triticale and is similar to that of barley. Accordingly, rye rations are to be complemented with amino acids.

Like other grain species rye is to be fed matured and not freshly harvested!

2. Limiting factors for the use of rye

Rye contains a high proportion of non-starch polysaccharides (NSP), especially of pentosanes. The negative impact of these indigestive components can be minimised by using NSP splitting enzymes, especially when feeding young animals. Hybrid rye is especially susceptible to ergot. The highest content of 1 g per kg of cereal grains required by law is to be adhered to. Rye lots containing ergot shall not be used for sows and piglets. Compared to wheat and triticale rye is clearly less infected with the *Fusarium* toxins Deoxynivalenol and Zearalenone. Occasionally there can be an increased foaming in liquid feeding with rye portions of more than 30 %, but the use of triticale and wheat can also cause bubble formation. This is caused by soluble proteins. A remedy to some extent is the adding of vegetable oil.

3. Pig feeding

The following recommendations are to be used under the provision that an amino acid supply as needed is guaranteed.

Survey 2: Recommendations for using rye in pig feeding

	Up to ... % rye in the ration
Growing-finishing pigs ¹⁾	
28-40 kg lw (preparatory ration)	30
40-60 kg lw (initial fattening stage)	40
60-90 kg lw (medium ration)	50
from 90 kg lw (finishing ration)	50
Sows	25
Piglets	
Up to 15 kg lw	10
From 15 kg lw	20

1) When foaming appears in liquid feeding rye proportions should be reduced. Adding vegetable oil might minimise the problem. With additional use of triticale the possible rye proportion should be reduced by an amount of one third of the added triticale amount, due to the high NSP content (e. g. with 30 % triticale the maximum recommended rye proportion is 40 % in the finishing ration).

4. Cattle feeding

When used in cattle feeding rye is subject to the same physiological aspects as the other grain species (except of maize).

The starch consistency of all grain species is understood with 15 %.

The quantity of the maximum grain use and thus also rye is primarily based on the proportion of easily soluble carbohydrates in the ration. In cattle feeding a tolerability of 25 % of variable starch and sugar in the dry substance of the total ration is considered as a limit. A proportion of 40 % rye can be recommended in compound feed for dairy cattle, rearers and feeder cattle, while dairy cattle shall not be given more than 4 kg daily.

Survey 3: Recommendations for using rye in cattle feeding

	Up to ... % rye
Calves	0 in starter feed 5-8 in calf growing feed ¹⁾
Rearing cattle	40 in compound feed
Feeder cattle	20 in compound feed (max. 1.0 kg rye/day)
Dairy cattle	40 in compound feed (max. 4.0 kg rye/day)

1) Higher values can presently not be recommended due to missing trial results.

The maximum quantity as mentioned shall not be utilized when the feed is applied individually and once a day.

5. Poultry feeding

With 12.2 MJ ME/kg rye is positioned between wheat (12.8 MJ ME/kg) and barley (11.4 kg ME/kg). Due to the non-starch polysaccharides contained, which might cause an increased viscosity of the intestine content and thus smeary excrements especially with chicks and chicken, young animals should be fed only with very low quantities of rye.

Survey 4: Recommendations of using rye in poultry feeding

	Up to ... % rye ¹⁾
Layer	20
Pullet	15
Chick	0
Cockerel chick	0
Chicken (finishing ration)	5
Fattening turkey < 5 weeks	0
> 5 weeks	5
Duck, Table goose > 3 weeks	0
< 3 weeks	5

1) The values refer to feed mixes without NSP splitting enzymes. Higher quantities require the use of appropriate NSP splitting enzymes.

