

## I.2

### The reduction of dark cutting beef incidence through administration of molasses solution to young bulls before slaughter

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Young bulls are very sensitive to stressors that accompany shipping and holding of animals before slaughter at an abattoir. Usually overnight holding results in substantial reduction of muscle glycogen leading finally to elevated ultimate pH of meat and dark cutting beef. The incidence of meat with dark colour was observed in nearly 90% of young bull carcases.

The aim of the experiments was to check the influence of treating animals with 3 and 6% water solution of molasses on restoring the muscle glycogen and thus improving meat quality. It was found that administering the 3% solution for 3 days before slaughter significantly reduced the amount of dark cutting beef by 60 to 70%. Moreover it was also observed that changing concentration of molasses up to 6% allows to get the same results already after two days of the treatment.

### Verkleinerung des DFD-Fleischanteils bei jungen Bullen durch Verabreichen von Melasse vor dem Schlachten

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Die jungen Bullen bilden eine Viehgruppe, die wegen Störungen der bisherigen Lebensweise durch Transport, wie auch durch den einzigen Aufenthalt in den Räumen des Schlachthauses am meisten empfindlich sind. Dadurch erfolgt eine ziemlich grosse Verkleinerung des Glykogenvorrates in den Muskeln und eine Erhöhung des pH-Werts im Fleisch. Durchschnittlich besitzt fast 90 % der Rindshälften der jungen Bullen ein dunkles Fleisch mit DFD-Eigenschaften. Das Ziel dieser Arbeit war, Untersuchungen durch Tränken des Viehs mit einer 3 % und 6 % Melassenlösung durchzuführen, um den Glykogenvorrat in den Muskeln und die Qualität des Fleisches zu verbessern. Die erhaltenen Ergebnisse zeigten, dass das Verabreichen von 3 % Melassenlösung drei Tage vor dem Schlachten einen wesentlichen Einfluss auf die Aufhellung des Fleisches und die Senkung des pH-Werts im Fleisch hat. Durch das Tränken der jungen Bullen mit Melassenlösung hat man eine Herabsetzung des DFD-Fleischanteils um 60 bis 70 % erreicht. Außerdem hat man nachgewiesen, dass die Erhöhung der Melassenkonzentration bis 6 % mit einem 0,01 %-igen Milchsäurezusatz /zur Geschmacksverbesserung/, die Ausruhzeit vor dem Schlachten von 3 auf 2 Tage verkürzen lässt.

## I.2

La réduction du pourcentage en viande DFD de jeunes taureaux, par addition de mélasse au fourrage avant l'abattage.

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Les jeunes taureaux forment un groupe de bétail le plus susceptible aux troubles dans le modus vivendi actuel, causés par le transport et une stabulation de 24 heures avant l'abattage. En résultat on observe une réduction significante des fonds du glycogène dans les muscles et une augmentation du pH de la viande.

En moyenne dans 90% des carcasses de jeunes taureaux on constate une viande foncée, ce qui caractérise la viande DFD. Le travail en question visait à constater l'influence d'un abreuvement du bétail avec une solution à base de 3 et de 6% de mélasse, en vue de rétablir les fonds du glycogène musculaire et d'améliorer la qualité de la viande.

Les résultats obtenus ont démontré, que l'abreuvement avec une solution à base de 3% de mélasse durant trois jours avant l'abattage, possède une influence réelle pour éclaircir la couleur de la viande et réduire le niveau du pH. En effectuant un abreuvement de jeunes taureaux avec une solution de mélasse, on est arrivé à une réduction de pourcentage en viande DFD de 60 - 70%. Au surplus on a constaté, qu'une solution plus intense, à base de 6% de mélasse avec addition de 0,01% d'acide lactique / pour corriger le goût/, permet de raccourcir la stabulation des taureaux de 3 à 2 jours.

Уменьшение доли мяса DFD у молодых бычков подачей мелассы до убоя.

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Молодые бычки составляют группу крупного рогатого скота наиболее чувствительную на нарушения существующего образа жизни вызванные транспортом и пребыванием в течении одного дня в доубойных складах скота. В результате наблюдается значительное уменьшение наличия гликогена в мышцах и повышение pH мяса. В среднем около 90% туш молодых бычков имеет тёмное мясо с приметами мяса DFD .

Целью труда было исследование воздействия поения крупного рогатого скота 3 и 6% раствором мелассы на восстановление ресурсов гликогена в мышцах и улучшение качества мяса. Полученные результаты доказали, что подача в течении трёх дней до убоя 3% раствора мелассы существенно влияет на осветление тона и снижение pH мяса. Применяя поение молодых бычков раствором мелассы уменьшено долю мяса DFD на 60% до 70%.

Кроме того доказано, что увеличение концентрации мелассы до 6% с добавлением 0,01% молочной кислоты (для улучшения вкуса) позволяет сократить время хранения бычков с 3 до 2 дней.

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Introduction

Young bulls are very sensitive to stressors that accompany long transportation and holding of animals over night at an abattoir.

In this time level of muscle glycogen rapidly decreases what has an adverse effect on meat quality.

The conditions of turnover are especially disadvantageous to young bulls of Lowland Black White Breed, which have very low level of intramuscular fat.

The observed incidence of meat with dark colour in carcasses of young bulls slaughtered the next day after arrival to an abattoir was nearly 90 percent.

The results reported herein are part of studies designed to find the ways of restoring the muscle glycogen by intake of molasses solution before slaughter and thus to improve meat quality of young bulls.

Material and methods

The young bulls of Lowland Black White Breed were objective of three experiments. The live weight of the bulls was about 430 kg.

**Experiment 1** : Fifty four young bulls were allotted to six experimental groups. The experiments lasted for 1, 2 or 3 days. In each experimental period one group received hay and water / control / and second group received hay and 3% solution of molasses. The experiments were conducted at an abattoir.

All bulls on the given treatment were slaughtered at a commercial facility. The results are shown in table 1.

**Experiment 2** : In this experiment 18 bulls were allotted to two groups. First group received hay and 6% solution of molasses for one day and second group of animals received the same diet for two days. To improve palatability of more concentrated solution 0,01% lactic acid was added.

**Experiment 3** : This experiment was conducted with 32 bulls. The animals were collected in cattle basis located about 25 km from the abattoir. The bulls were treated for 3 days with hay and water or 3% solution of molasses. At the end of treatment period all bulls were transported to the abattoir and slaughtered within one hour. At the time of slaughter blood was taken for determination of lactic acid. Percentage lactic acid in blood was determined using Bergmeyer method / 2 /. The pH readings were taken approximately 48 hours after slaughter by direct insertion of combined electrode into lumbar part of m.l.dorsi.

A glycogen content of this muscle was also determined / 4 /. The colour at m.l.dorsi cross section was rated subjectively at 48 hr postmortem using standard scale used in meat factories. According to this scale the colour of meat above 5 points was regarded as too dark. Standard statistical analysis of variance was applied to collected data.

Results and discussion

Results of experiments are shown in tables 1 to 3.

The first experiment was undertaken to examine the effect of intake of 3% solution of molasses for one to three days, on restoring the muscle glycogen. The means results of this experiment are given in table 1.

table I

Effect of molasses intake on meat quality of young bulls  
/mean characteristics from experiment 1, 3% solution /

Item	Kind of treatment	Time of treatment /days/		
		1	2	3
pH	water	6,26	6,36	5,94
	molasses	5,97	5,99	5,62
Glycogen in meat mg/g	water	1,30	2,36	34,03
	molasses	14,61	21,75	41,44
Lactic acid in blood mg/100ml	water	5,57	6,18	5,42
	molasses	5,77	5,71	5,84
Percent of dark cutting beef	water	88	78	33
	molasses	56	33	22

The collected data indicate significant effect of molasses on pH, on level of muscular glycogen and on incidence of dark cutting beef.

The bulls which were given 3% solution of molasses had better meat quality.

The best quality was observed after three days resting and treatment with molasses.

These bulls show also higher dressing data.

The incidence of dark cutting beef was reduced to 20 per cent. The pH of meat was on average 5,6.

In the experiment 2 more concentrated solution of molasses was used in order to find a possibility of cutting down the time of treatment. A solution containing 6% of molasses with addition of 0,01% lactic acid to improve a taste was used.

table II

Effect of molasses intake on meat quality of young bulls  
/ mean characteristics from experiment 2, 6% solution /

Item	Kind of treatment	Time of treatment /days /	
		1	2
pH	water	6,26	6,26
	molasses	6,00	5,64
Percent of dark cutting beef	water	88	78
	molasses	56	11

The more concentrated solution of molasses improved meat quality of treated bulls already after two days instead of three days as it was observed in the experiment 1. The pH of meat was similarly decreased on the average to 5,6 and the incidence of dark cutting beef was reduced to 11 percent.

To avoid overcrowding of preslaughter accomodations at an abattoir collected animal

are often kept at cattle basis situated up to 30 km from the abattoir. In the experiment 3 the bought bulls were delivered and kept in one of those basis for three days, treated with molasses and next transported by trucks for slaughter.

table III  
Effect of treatment young bulls with 3% solution of molasses  
at cattle basis  
/mean characteristics from experiment 3 /

Item	kind of treatment	
	water	molasses
pH	6,20	5,75
Glycogen in liver mg/g	319,8	589,9
Glycogen in meat mg/g	7,1	49,4
Lactic acid in blood mg/100 ml	8,41	7,33
Percent of dark cutting beef	88	19

In this experiment the observed effect of molasses intake was even greater than in previous experiment 1.

The bulls treated with 3% solution of molasses possessed higher reserves of muscle and liver glycogen, lower pH of meat and lesser incidence of dark cutting beef. The control group treated with water had 88% carcasses with dark cutting beef and the group treated with molasses only 19 percent.

These results indicate that during additional transportation the molasses intake better protected meat quality than only hay and water.

Similar results were reported by Briskey et al./ 1 / who fed sucrose to finishing pigs which had been exercised before slaughter.

Therefore molasses provides a readily available source of energy which may protect animals during transportation to an abattoir and which also accelerates an improvement of meat quality after long turnover/ 3 /.

#### Conclusions

The molasses intake before slaughter by young bulls significantly reduces the amount of dark cutting meat to 20% and decreases pH of meat to 5,6. To obtain this effect animals should be treated with 3 or 6 percent solution of molasses for 3 or 2 days, respectively.

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