

RESEARCH RESULTS OF DYNAMICS AND DEGREE OF PIGS AND CATTLE BLEEDING AS BASIS FOR HIGHER BLOOD USAGE

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SUMMARY

In order to provide the precise establishing of dynamics and degree of pigs and cattle breeding, there was the observation carried out of the blood quantities collected within three time intervals - 30 min, 60 min, 90 min (totally 180 min). As the factors effecting to bleeding, there were observed sex, weight of the animals before slaughtering and stunning for the pigs, i.e. sex and weight for the cattle. Based on the research results, it has been established the highest bleeding intensity for pigs and cattle is within first 30 min, with tendency of the regular decrease within two succeeding time intervals. The quantities of blood, interesting from the commercial point of view, i.e. 3 kg per pig, 13 kg per young bull and approx. 11.7 kg per heifer, can be collected within first 90 min of bleeding, since within this period about 90% of the totally collected blood bleeds out. Also, the statistical importance of the influence of the observed factors was found out.

INTRODUCTION

It is known that besides a number of factors, the significant effect to hygienic correctness, quality and shelf life of the meat, has the bleeding, intensive and complete, as much as possible. The experience has shown, and the research results provided by various authors have confirmed, that the slow and insufficient bleeding regularly appear with sick and insufficiently prepared animals for slaughtering and bad stunning. Therefore, such meat has less quality and shorter shelf life. Having in mind that in the meat production plants such negative effect of the mentioned factors is mainly excluded (applying the up to date hygienic and technology facilities), there are other elements effecting to dynamics and degree of the bleeding (weight of the animal, age, sex, fattening degree, type of stunning). Therefore, all research within the scope of these topics have the exceptional importance, particularly from the standpoint of obtaining the optimum conditions which should provide the production of the meat hygienically correct, with top quality and period of shelf life. However, researching the dynamics and degree of bleeding of the animals for slaughtering is becoming interesting also from the point of view of getting, processing and utilising the blood quantities as much as possible. Due to this reason, we have decided, first of all, to act within this subject, paying the separate

attention to the influence of sex, weight and stunning, to dynamics and degree of pigs and cattle breeding, particularly if we have in mind that in the Yugoslav meat industry there are no such precisely established data, and that the usage of blood is almost symbolic.

MATERIALS AND METHODS

The dynamics and degree of bleeding research was done on totally 100 pigs and 90 cattle.

The tested pigs belong to domestic meaty race, and the weight of the animals before slaughtering was 95-100 kg. Out of 100 pigs there were two experimental groups formed: 50 males and 50 females. Within each group, 25 were stunned with electric current (75-80 V; 0,5 A) and 25 were not. The cattle (18 months old) have belonged to Simmental race (Yugoslav type). Out of totally 90 pieces there were two experimental groups formed: 45 males and 45 females. Depending on the animal weight before slaughtering, each group was divided in three weight groups (each 15 pcs.), being as follows: light (350-400 kg), medium (401-450 kg) and heavy (451-500 kg). Each animal was stunned mechanically, with "Schermer gun". Slaughtering of all observed individuals has been performed in usual way in up to date conditions of modern industrial plant, and with bleeding in hanged position.

Dynamics and degree of bleeding were observed through three time intervals: the first 30 sec. of bleeding, then 30

Tabl.1.: Dynamics and degree of bleeding with the stunned and unstunned pigs, different sex

Sex	Observed bleeding intervals	dt= kg %	P		i		g		s		Testing of aritm. means diff.
			Stunned	Unstunned	Cv	Cv	Cv	Cv			
			$\bar{x}(n=25)$	$\bar{x}(n=25)$	$\bar{x}(n=25)$	$\bar{x}(n=25)$	$\bar{x}(n=25)$	$\bar{x}(n=25)$	$\bar{x}(n=25)$	$\bar{x}(n=25)$	
Males (n=50)	I	dt= kg %	1,87	7,00	1,45	7,52	0,42	**	**		
		30" %	54,83	0,22	44,87	0,64	9,98	**	**		
	II	dt= kg %	1,18	7,03	1,29	6,67	0,11	**	**		
		60" %	34,69	0,78	39,90	1,36	5,21	**	**		
Males (n=50)	III	dt= kg %	0,36	8,61	0,49	6,53	0,13	**	**		
		90" %	10,46	5,69	15,23	2,74	4,77	**	**		
	Total	kg %	3,41	7,13	3,23	7,06	0,18	**	**		
	t=180"	%	100,00	-	100,00	-	-				
Females (n=50)	I	dt= kg %	1,98	7,59	1,54	6,87	0,44	**	**		
		30" %	54,85	0,30	44,84	0,30	10,01	**	**		
	II	dt= kg %	1,25	7,54	1,37	6,83	0,12	**	**		
		60" %	34,81	0,34	39,92	0,25	5,11	**	**		
Females (n=50)	III	dt= kg %	0,37	6,05	0,52	7,19	0,15	**	**		
		90" %	10,34	2,03	15,24	1,13	4,90	**	**		
	Total	kg %	3,60	7,49	3,43	6,98	0,17	**	**		
	t=180"	%	100,00	-	100,00	-	-				

% - collected blood during the observed time intervals in the mass of totally collected blood;

** - $p < 0,01$

to 90 sec. and, finally, from 90 to 180 sec. Consequently, total observed time of bleeding was 180 sec.

The data processing was done with accepted mathematics - statistics methods on "Wang" Co. computer.

RESULTS AND DISCUSSION

The results referring to dynamics and degree of pigs bleeding of approx. same weight (95-100 kg), depending on sex and stunning, are shown in Table 1.

It can be noticed that with the female individuals, the total collected quantity of blood, in respect to the males is higher for 0.190 kg (5.5%) with the stunned ones, i.e. for 0.200 kg (6.2%) with unstunned ones ($P < 0.01$). Also, the statistically important effect of stunning to totally collected quantity of blood was established ($P < 0.01$). The stunned males, comparing to unstunned ones, bleed as 0.180 kg (5.57%) more and with females for 0.170 kg (4.96%).

The largest blood quantities, regardless the sex and stunning, have been reached within first bleeding time interval ($dt = 30$ min), and upon the bleeding time extension, the quantities are regularly decreased. During the first stage, the stunned males and females had the higher bleeding intensity than the unstunned ones, and the average value differences (0.420 kg, i.e. 0.440 kg) have been statistically confirmed at the level of $P < 0.01$.

Within the later on intervals ($dt = 60$ min; $dt = 90$ min) the slightly higher bleeding was established at unstunned individuals, and this was also confirmed in statistics importance of average values differences at the level $P < 0.01$.

Data on dynamics for bleeding, established through the share of collected blood during the observed time intervals in the mass of totally collected blood (%), are showing that there are no differences between the males and females. Namely, a share of the blood got within the first 30 sec. of bleeding for stunned pigs, males and females, amounts to approx. 54.8%, and for unstunned approx. 44.8% ($P < 0.01$). Also, there are no differences appeared between males and females for other observed intervals ($dt = 60$ min and $dt = 90$ min), but a share of collected blood in these intervals is higher with unstunned individuals ($P < 0.01$). Results referring to dynamics and degree of cattle bleeding, depending on sex and weight of animal before slaughtering, are shown on the Table 2.

It can be clearly noticed, that within the same weight groups, the larger quantity was collected with the males: for 1.4 kg (12.02%) with light ones, 1.4 kg (10.74%) with medium heavy ones and for 1.6 kg (11.64%) with group of heavy ones.

Regardless the sex and weight of the animals before slaughtering, the largest quantities of the blood have been collected within the first 30 sec of bleeding, and during the procedure duration quantities are regularly decreased. It has been also noticed that for males and females as well as for each bleeding interval, the average quantity of collected blood is being increased proportionally to the increase of the animal weight before slaughtering. Mainly, such tendencies have the confirmation in the statistics importance of differences, particularly between the light and heavy weight groups.

The similar tendency has been found out also for totally collected quantities of blood, i.e. during the entire 180 sec bleeding interval. Thus, comparing to the light weight

Tabl. 2.: Dynamics and degree of bleeding of cattle with different sex and weight before slaughtering

Sex	Observed indicating values	Weight groups						Testing the importance of arithmetics means differences			
		Light (350-400 kg)		Medium (401-450 kg)		Heavy (451-500 kg)		L : M	L : H	M : H	
		$\bar{x}(n=15)$	Cv	$\bar{x}(n=15)$	Cv	$\bar{x}(n=15)$	Cv				
Males (n=45)	Weight before slaughtering	kg	381,00	3,48	429,33	2,41	478,67	2,97	48,33 ^{xx}	97,67 ^{xx}	49,34 ^{xx}
	I dt=30"	kg	9,44	14,07	10,69	17,16	10,09	11,14	1,25 ^{xx}	0,65 ^{ns}	0,60 ^{ns}
		%	2,47	12,29	2,49	18,19	2,11	10,80	0,02 ^{ns}	0,36 ^{xx}	0,38 ^{xx}
	II dt=60"	kg	2,59	34,88	2,68	22,55	3,52	23,22	0,09 ^{ns}	0,93 ^{xx}	0,84 ^{xx}
		%	0,68	34,34	0,62	23,03	0,74	22,85	0,06 ^{ns}	0,06 ^{ns}	0,12 ^{ns}
Females (n=45)	III dt=90"	kg	1,02	37,62	1,07	52,39	1,64	44,33	0,05 ^{ns}	0,62 ^{xx}	0,57 ^x
		%	0,27	37,07	0,25	53,00	0,36	31,03	0,02 ^{ns}	0,09 ^x	0,11 ^x
	Totally (180")	kg	13,05	11,42	14,44	13,60	15,25	9,31	1,39 ^x	2,22 ^{xx}	0,81 ^{ns}
		%	3,42	9,64	3,36	14,27	3,21	9,48	0,06 ^{ns}	0,21 ^{ns}	0,15 ^{ns}
	Weight before slaughtering	kg	379,00	2,87	430,33	2,79	478,33	3,05	51,33 ^{xx}	99,33 ^{xx}	48,00 ^{xx}
I dt=30"	kg	8,70	15,45	8,84	11,76	9,71	13,76	0,14 ^{ns}	1,01 ^x	0,87 ^{ns}	
	%	2,29	15,21	2,05	10,74	2,03	13,33	0,24 ^x	0,26 ^x	0,02 ^{ns}	
II dt=60"	kg	2,01	31,36	3,04	28,60	2,79	22,25	1,03 ^{xx}	0,78 ^{xx}	0,25 ^{ns}	
	%	0,53	31,30	0,71	28,28	0,58	27,67	0,18 ^x	0,05 ^{ns}	0,13 ^{ns}	
III dt=90"	kg	0,94	58,63	1,16	30,65	1,16	29,32	0,22 ^{ns}	0,22 ^{ns}	0 ^{ns}	
	%	0,25	59,20	0,27	31,41	0,24	29,17	0,02 ^{ns}	0,01 ^{ns}	0,03 ^{ns}	
Totally (180")	kg	11,65	7,51	13,04	9,09	13,66	11,27	1,39 ^{xx}	2,01 ^{xx}	0,62 ^{ns}	
	%	3,07	7,35	3,03	8,86	2,85	8,22	0,04 ^{ns}	0,22 ^x	0,18 ^{ns}	

x - $p < 0,05$; xx - $p < 0,01$; ns - not significant; % - in weight before slaughtering

group, heavy male cattle have a stronger bleeding - approx. for 2.22 kg (16.85%), while with females this increase amounts 2.01 kg (17.25%). Differences of the average values, in both cases, are statistically important at the level $P < 0.01$.

Data about dynamics of bleeding have been established through a share of the collected blood within the observed time intervals, in respect to the weight of the animals before slaughtering. It has been noticed that for males and females, as well as in all three groups, the quantity of collected blood is largest within the first 30 sec of bleeding, having a tendency for the regular decrease during two succeeding time intervals.

Opposite to data provided for the corresponding absolute values, a share of totally collected quantity of blood (within 180 sec of the bleeding) is highest with the light weight group of both sex, and it is gradually decreased by the increase of the average weight of the animal before slaughtering. However, the mutual difference of the average values do not have the statistical importance, exposed between the light and heavy weight groups of heifers ($P < 0.05$).

Finally, it can be stated that the average share of the totally collected blood quantity within a weight of the male cattle before slaughtering amounts to 3.42 up to 3.21% and in all three weight groups it is higher than with heifers which have such bleeding ratio from 3.07-2.85%.

CONCLUSIONS

Based on the research results, established within the conditions of our experiment, the following essential conclusions can be reached:

1. Within the approximately equal weight before slaughtering, females have a better bleeding with the pigs, and males with the cattle.
2. For pigs, males and females, the statistically important influence of stunning in respect to more favourable degree and dynamics of bleeding was also found out ($P < 0.01$). Stunned pigs have more intensive bleeding during initial 30 sec, and the unstunned ones during succeeding two observed time intervals.
3. With pigs and cattle, males and females, the bleeding intensity is highest within first 30 sec, and with tendency

of gradual decrease within next two time intervals ($dt = 60 \text{ min}$; $dt = 90 \text{ min}$).

4. Increasing the weight of the cattle, both sex, quantity is increased (kg), but there is the decrease of the share (%) of totally collected blood in the weight of the animal before slaughtering.

5. Commercially interesting quantities of blood (approx. 3 kg per pig, approx. 13 kg per young bull and approx. 11.7 kg per heifer), can be collected in the first 90 sec of bleeding, regarding the fact that about 90% of totally collected blood, bleeds out during that period of time.

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