RESEARCH FOR IMPROVING BEEF PRODUCTION USING THE COMMERCIAL CROSSBREEDING WITH SPECIALIZED BREEDS

V. Ujică[1], V. Maciuc[1], I. Nistor[2], C. Viziteu[3], C.E. Nistor[1], E.C. Popescu[1]

[1]University of Agricultural Sciences and Veterinary Medicine, Iaşi
[2]A.N.A.R.Z,. Bucureşti
[3]O.A.R.Z., Bacău
email: vasileujica@yahoo.com

In the aim of knowing the influence of beef breeds, in crossbreeding with domestic breeds, Black and White Romanian and Romanian Spotted, for beef production improving we conducted two experiences, a crossbreeding with Blank Belgian Blue on one hand and Limousine and Charolaise on the other hand, the obtained half-breeds being capitalized for beef. The objectives followed by the experimental protocol were: insemination of domestic breeds with semen from beef breeds and follow of reproduction indices (insemination number, gestation days, calf sex and parturition kind, the percent of non-return at 56 days, percent of abortion etc.); observation of half-breeds calf growing process until 18 months by: body weight determination, growing indices of main corporal measurement, total gain and average daily gain for age stages, calf slaughter and follow the qualitative and quantitative beef indices, including chemical analyses and histological determination for beef. The results shown that commercial crossbreeding has beneficial effects, the most favourable ones were crossbreeding of BBB breed with Romanian Spotted cows and by using Limousine and Charolaise breeds.

Key words: beef production, commercial crossbreeding, reproduction indices

INTRODUCTION

Nationally research regarding beef production improvement by crossbreeding has started at the beginning of 60's with E. Raicu and col. (1964), Al. Furtunescu and col. (1964), V. Temişan (1976) researches and were amplified after 1989 by V. Ujică, I. Pântea, L. Popovici, I. Nistor, C. Viziteu from Faculty of Animal Sciences Iaşi, completed in some PhD dissertation , and by Gh. Georgescu, C. Călin, I. Muşat, C. Velea, Gh. Mureşan, T. Oroianu, I. Vintilă, Şt. Acatincăi, G. Stanciu, researches, and others.

For the same subject were interested ANARZ Bucharest specialists and others from the production field like Vet. V. Pachitanu from T.C.E. 3 Brazi SRL Neamt, the initiator for industrial crossbreeding with beef breeds in Moldova.

MATERIAL AND METHOD

In the aim of knowing the influence of modern beef breeds (Blanc Belgian Blue, Charolaise, Limousine) for improving beef production was organized tow crossbreeding experiences in private farms from Moldova, the objectives were:

- Autohton Cows breeds insemination with semen from specialized beef breeds and following reproduction indexes (insemination number, gestations days, calves sex, calving ease, abortion percent and calves mortality, etc)
- Calves cross-breed growing process supervising from birth to 18 months with corporal weight determination and corporal measurement growing indices, total gain and average daily gain for age stages.
- Calves slaughter and principal quantitative and qualitative beef indices supervision.

Crossbreeding experiences between Charolaise and Limousine bulls with Romanian spotted and Black and white Romanian cows was made by C. Vizitiu in tow private farms from Bacau county, the cross-breeds was slaughter at 18 months.

After insemination were obtained a number of 151 calves from which 85 males and 66 females in the following genetic combinations: L x RS 25 calves; Ch x RS 28 calves; Ch x BWR, 22 calves; L x BWR, 25 calves.

Calves' development analysis for experimental batch from birth to 18 months highlights these (tab.1 and 2, fig.1 and 2).

Table 1. Corporal weight and principal corporal dimension from birth to 18 months

Specification	Age (months)	B_1 Rs		B_2 L x Rs		B_3 Ch x Rs		B_4 BWR		B_5 Ch x BWR		B_6 L x BWR	
		$\overline{X}$	s	$\overline{X}$	s	$\overline{X}$	s	$\overline{X}$	s	$\overline{X}$	s	$\overline{X}$	s
Corporal weight, kg	Birth	36.92	2.06	39.00	2.06	40.96	2.50	35.74	1.45	36.77	2.02	37.16	1.51
	6 months	209.57	4.16	224.53	6.33	245.00	8.80	188.20	3.61	220.23	2.20	212.31	1.93
	12 months	395.36	9.05	440.67	9.52	481.33	12.16	332.14	5.17	413.46	5.93	386.38	6.66
	18 months	583.44	11.72	657.67	8.32	697.50	11.48	501.33	6.50	606.22	6.70	573.13	6.46
Height at withers, cm	Birth	76.57	1.45	78.00	1.51	85.40	1.76	69.79	2.39	71.54	2.36	68.69	1.18
	6 months	106.93	1.38	107.80	1.14	110.40	1.59	100.21	2.25	102.77	2.77	102.08	2.13
	12 months	119.64	1.15	121.33	1.34	125.20	1.69	125.64	2.84	125.85	2.79	126.85	2.76
	18 months	132.11	2.80	128.89	1.05	133.20	1.93	130.11	1.61	131.11	2.00	131.13	1.35
Body length, cm	Birth	75.00	1.46	79.73	1.83	87.13	1.68	70.50	2.44	72.85	2.44	70.15	2.03
	6 months	134.57	1.22	137.47	2.94	143.00	1.64	126.07	2.40	132.23	2.04	129.23	1.92
	12 months	159.29	1.38	161.80	1.61	168.00	1.73	139.86	2.93	151.69	1.65	146.15	1.67
	18 months	169.44	1.59	185.78	2.10	188.30	1.88	161.78	2.22	171.78	2.16	166.63	1.99
Chest depth, cm	Birth	30.64	1.51	33.67	1.29	36.73	1.43	30.86	1.46	32.31	1.31	31.08	1.32
	6 months	45.93	1.68	50.27	1.22	54.13	1.30	49.50	1.69	49.77	1.58	48.38	2.06
	12 months	56.21	1.42	57.80	1.47	61.07	1.28	53.14	1.99	56.92	1.65	51.92	1.75
	18 months	60.44	2.40	67.44	0.88	70.60	2.06	56.67	1.58	64.78	1.98	60.00	2.50
Chest circumference, cm	Birth	79.71	1.13	81.13	1.99	88.47	1.68	72.07	2.46	75.31	2.42	71.46	1.33
	6 months	136.57	1.65	138.20	1.69	146.40	1.99	121.21	2.15	130.85	2.70	122.85	1.77
	12 months	157.07	1.77	165.07	2.21	171.40	2.13	145.93	2.40	155.85	2.70	147.85	1.86
	18 months	171.56	2.40	179.22	2.33	183.20	2.09	164.33	2.78	173.89	4.01	170.63	2.82
Shine circumference, cm	Birth	11.57	0.75	12.49	0.91	14.47	0.91	12.29	1.26	13.00	1.15	11.23	1.09
	6 months	18.14	1.02	21.20	0.94	21.53	1.06	15.50	0.85	18.31	1.43	15.43	1.19
	12 months	20.57	1.28	22.27	0.88	24.27	1.22	17.21	0.57	20.31	1.84	19.46	1.56
	18 months	26.44	1.59	26.22	1.20	29.60	1.07	24.56	1.13	24.78	1.64	23.13	1.24
Head width at the orbits, cm	Birth	10.86	0.66	11.93	1.16	12.27	0.88	10.86	0.94	11.54	0.96	10.54	1.05
	6 months	21.00	0.87	20.13	1.12	21.13	1.18	16.79	0.89	16.31	1.18	15.54	0.96
	12 months	22.18	1.12	21.67	1.04	23.07	1.22	17.93	0.91	18.31	1.37	17.00	1.35
	18 months	22.78	1.71	25.33	1.22	27.30	1.49	22.78	0.97	22.89	1.45	20.75	1.38

Table 2. Growing indices for corporal weight

Batch	Age	Corporal weight, kg	Growth expressed as:				
			Max. gain, kg		Gain percentage %	Growing intensity %	Growing factor %
B_1 Rs	Birth	36.92	-	-	-	-	6.01
	6 months	209.57	172.65	0.959	82.38	140.09	34.12
	12 months	395.36	185.79	1.032	46.99	61.42	64.38
	18 months	583.44	188.08	1.044	32.23	38.43	95.00
	Adult	614.10	30.66	0.170	4.99	5.12	100.00
B_2 L x Rs	Birth	39.00	-	-	-	-	5.93
	6 months	224.53	185.53	1.030	82.63	140.80	36.56
	12 months	440.67	216.14	1.200	49.04	64.98	71.75
	18 months	657.67	217.00	1.205	32.99	39.51	107.09
	Adult	614.10	43.57	0.242	7.09	6.85	100.00
B_3 Ch x Rs	Birth	40.96	-	-	-	-	6.66
	6 months	245.00	204.04	1.133	83.28	142.70	39.89
	12 months	481.33	236.33	1.312	40.09	65.07	78.37
	18 months	697.50	216.17	1.200	30.99	36.67	113.58
	Adult	614.10	83.40	0.463	13.58	12.72	100.00
B_4 BWR	Birth	35.74	-	-	-	-	6.61
	6 months	188.20	152.46	0.847	81.00	136.16	34.82
	12 months	332.14	143.94	0.799	43.33	55.32	61.46
	18 months	501.33	169.19	0.939	33.74	40.59	92.77
	Adult	540.36	39.03	0.216	7.22	7.49	100.00
B_5 Ch x BWR	Birth	36.77	-	-	-	-	6.80
	6 months	220.23	183.46	1.019	83.30	142.77	40.75
	12 months	413.46	193.23	1.073	46.73	60.98	76.43
	18 months	606.22	192.76	1.070	31.79	37.80	112.18
	Adult	540.36	65.86	0.365	12.18	11.48	100.00
B_6 L x BWR	Birth	37.82	-	-	-	-	6.99
	6 months	212.31	174.49	0.969	82.18	139.52	39.29
	12 months	386.38	174.07	0.967	45.05	58.24	71.04
	18 months	573.13	186.75	1.037	32.58	38.92	106.06
	Adult	540.36	32.77	0.182	6.06	5.88	100.00

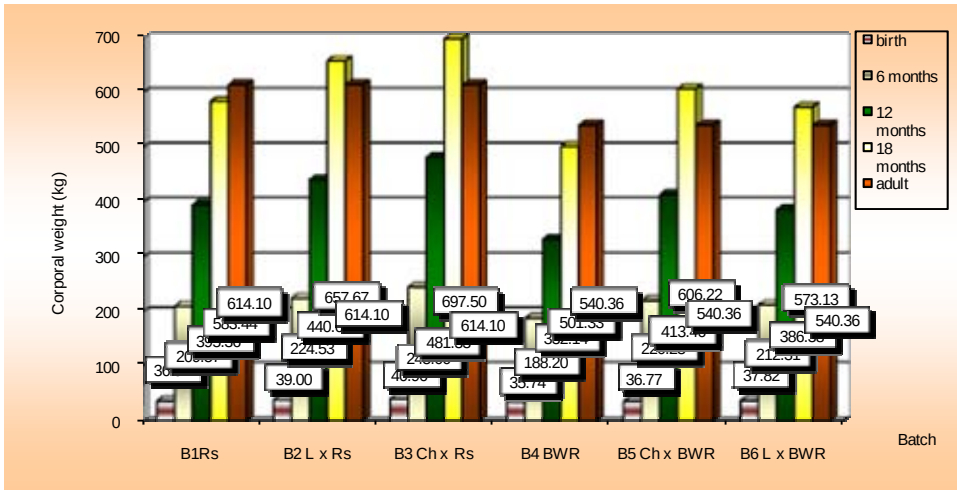

Fig. 1. Growing energy for weight from birth to 18 months

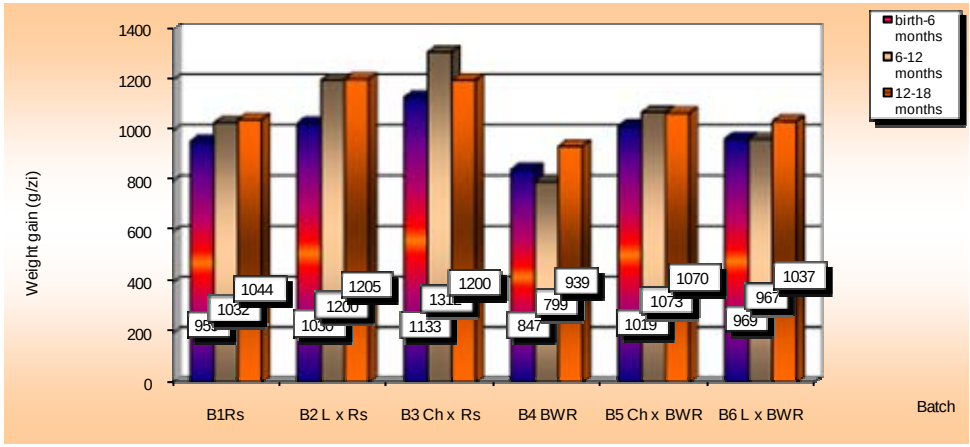

Fig. 2. Growing energy for weight from birth to 18 months

After analysis' results for corporal weight evolution showed that RS cross-breeds had a superior growing intensity then BWR and a more good exteriorization of heterozis fact. In bought cases cross-breeds had a superior corporal weight then maternal breeds (RS x BWR), which justifies the use of this cross type.

Corporal dimensions analyse showed similar issue to corporal weight, cross-breeds L x BWR, Ch x BWR and Ch x RS detaching itself from L x BWR and Ch x BWR cross-breeds by superior corporal development.

After growing index analyses (growing energy, absolute and relative speed, growing intensity and growing factor) the results showed that all cross-breeds had a superior growing speed and intensity then maternal breeds.

Following growing factor coefficient for corporal weight was observed that Ch x RS cross-breeds at 18n mouth age exceed maternal breed with 13.58%, L x RS with 7.09%, Ch x BWR with 6.06%.

Besides corporal weight like principal indices, beef production appreciation it's made on the basis of average daily gain.

In our experiences we don't practice cross-breeds fattening, for that reason will

show the average daily gain for all growing period (fig 2).

From data analysis we finds that experimental baths have an average daily gain between 930.43 g (B4 BWR) and 1245.13 g (B3 Ch x RS). Except BWR breed finds averages daily gains over 1000 g, the most good results was obtain to B_3 L x RS and B_3 Ch x RS.

The differences between bath B_1 RS and B_6 L x BWR, and B_5 bath Ch x BWR are not significant. But between the other baths the difference are significant, B_3 cross-breeds Ch x Rs had a superior average daily gain with 314.7 g more than B_4 bath BWR and with 206,38 g more than B_6 cross breeds L x RS who had an average daily gain with 259.24g bigger than B_4 BWR.

Slaughter appreciation results

Carcass size is main propriety if we consider that establish quantitative beef production indices values and their share is decisive in final economic efficiency.

From traits which define carcass size we analysed these: carcass weight, slaughter yield and quarters share in carcass (tab. 3).

Table 3. Appreciation at slaughter

Batch	Live weight at slaughter (kg)	Carcass weight (kg)		Quarters weight (kg)		Yeld (%)	
		at warm	at cold	anterior	posterior	at warm	at cold
B_1 Rs	583.44	336.33	330.42	179.85	156.48	57.63	56.12
B_2 L x Rs	657.67	402.11	392.14	242.75	159.36	61.14	58.74
B_3 Ch x Rs	697.13	436.75	430.63	236.54	200.21	62.63	61.72
B_4 BWR	501.43	263.57	258.47	129.96	133.61	52.71	51.08
B_5 Ch x BWR	606.22	363.89	360.18	187.83	176.06	60.01	59.26
B_6 L x BWR	573.13	338.00	331.56	172.47	165.53	59.21	57.83

Analysing weight carcass at warm it's obvious that L x RS and Ch x RS cross-breeds was obtained big carcass over 400 kg each and from Ch x BWR and L x BWR cross-breeds and from Rs pure breed was obtained carcass over 300 kg each. From pure breed BWR bath was obtained the smallest carcasses averaged 263.57 kg.

Compared with maternal breeds to all four cross-breeds genetic groups were obtained higher weight carcasses, following carcasses development in length and width, and in the same time with macro elements and obvious beef production skills development. Similar aspects resulted from cold weight carcasses analyse.

Analysing quarter share of carcass weight (tab.3) it s obvious that carcasses anterior quarters had a bigger percent in carcass weight than posterior quarter, first ones representing between 49.3% and 60.38% from carcass weight.

Our data shows an exception for B_4 bath BWR were anterior quarters share was 49.3%, inferior to posterior carcasses quarters share which had 50.69% from carcass weight (at warm). We consider a particular situation for B_2 batch L x Rs were the anterior quarters of carcasses representing L x Rs from carcass weight and the posteriors quarters 39.63%, that means a lower development for hindquarters.

Concerning to carcass quarter share it's obvious that Charolaise and Limousine Beef breeds tend to modify quarter ratio in the part of growing posterior quarter share. This means a more good development of posterior part of carcass for cross-breeds and more beef quantity with superior quality.

Slaughter yield for experimental batch shows superiority of Charolaise and Limousine cross-breeds compared with Rs and BWR autochthones breeds (tab.3)

For B_3 batch Ch x Rs and B_2 L x Rs warm yield exceeds 60%. In the same time its obvious 60.01% yield for B5 cross-breeds Ch x BWR and 59.21% for B6 cross-breeds L x BWR, beef breeds contributing to beef skills improvement for BWR breed.

Batches differences are significant and sow the superiority of Charolaise and Limousine than BWR and Rs breeds. In the same time results for slaughter yield shows

Charolaise cross-breeding superiority than Limousine and Rs superiority than BWR.

CONCLUSIONS

The results from crossbreeding Rs and BWR breed with specialized beef breeds experiences (Charolaise and Limousine) justify the utility of this commercial crossing in the aim of beef production improvement. Rs x Ch and Rs x L cross-breeds, in special, had averages daily gains over 1000g, and 600kg at 18 mount age, fits to meet animal morphological type.

Ch x Rs and L x Rs cross breeds had the most pronounced skills for beef production with a total score between 13 and 15 points, followed by Ch x BWR and L x BWR cross-breeds which has 12 to 13,5 point the like as Rs batch.

Slaughter yield assessment shows cross-breeds of Charolaise and Limousine superiority compared with maternal autochthones breeds, for B3 Ch x Rs and B2 L x Rs warm yield exceeding 60%.

Start from our researches results and another studies from our country for combinative capacity of autochthones breeds with modern meet breeds (Charolaise, Limousine, Blanc Belgian Blue, Aberdeen Angus, Piemontese, Simmental for beef) was made a special program for private households from Moldova area to grow and improve beef production.

REFFERENCES

[1] Acatincăi, Şt., 2006 - Consideraţii privind situaţia actuală şi de perspectivă a cărnii de taurine în Uniunea Europeană şi în România. Revista de zootehnie, an III, nr. 3, septembrie 2006, Iaşi, p. 3-7.

[2] Acatincăi, Şt., 1999 - Cercetări privind aptitudinile de carne ale tineretului taurin de rasa BR. Teză de doctorat, USAMVB, Timişoara.

[3] Bănică, Gh., 1966 - Încrucişarea industrială a taurinelor pentru producţia de lapte şi carne. Redacţia revistelor Agricole, Bucureşti.

[4] Baran, P.M., Dinescu, Şt., 1977 - Aprecierea calităţii animalelor pentru carne. Editura Ceres, Bucureşti.

[5] Bibé, B., Foulley, J.L., 1976 - Efects d'heterosis chez les bovines viande: rezultats bibliographic. In l'heterosis; aspects theoriques et experimentaux. Bull. Tech. Dep. Genet. Anim., INRA 24, 87-110.

[6] Bonaiti, B., Bibe B., Hary A., Menissier F., 1988 - Comparaision des races bovines Charolaise, Limousine et Maine Anjou en races pure et en intercroissement. 2. Performances d'éngraissement des taurillons pure et F1. Genet. Sel. Evol., 20, 343-356.

[7] Călin, I., 1997 - Cercetări privind potenţialul de creştere, îngraşare şi calitatea cărnii la rasa BNR. Teză de doctorat, USAMV, Bucureşti.

[8] Cundiff, L. V. and Gregory, K.E., 1977 - Beef Cattle Breeding. USDA Agric. Info. Bul. nr 286.

[9] Cziszter, L.T., 1999 - Cercetări privind îmbunătăţirea tehnologiei de creştere şi hrănire a viţeilor până la 6 luni. Teză de doctorat, USAMVB, Timişoara.

[10] Dincă Gh., Dobre I., Elena, Bezic, 1967 - Contribuţii la stadiul unor indici ai producţiei de carne la metişii obtinuţi prin încrucişare industrială dintre rasele locale ameliorate cu tauri din rasele precoce de carne. Lucrare ştiinţifică ICZ, vol XXV, Red. Rev. Agric. Bucureşti.

[11] Duffy, P.A., 1987 - Performance carnee des races bovines suisses: Qualité de la viande chez les taurillons. Revue Suisse Agric., 9 (4), 204-207.

[12] Furfurică, A., 1972 - Cercetari privind rezultatele încrucişării vacilor de rasa Brună cu tauri din rasele de carne. Teza de doctorat, IANB, Bucuresti.

[13] Furtunescu, Al., şi col., 1964 - Unele caracteristici ale producţiei de carne la metişii F1 dintre taurii Hereford şi vaci din rasa BR, Pinzgau şi Sura de Stepa, Lucrare ştiinţifică, INAB, p. 385.

[14] Georgescu, Gh. şi col., 1973 - Aptitudes pour la production de viande des principales races de bovines et groupes de métis élevés en Roumanie. Bull de l'Academie des Sciences Agricoles et Forestières, 2, A.S.A.S., Bucureşti.

[15] Georgescu, Gh., Ujică V. şi col., 1990 - Tehnologia creşterii bovinelor. Ed. Didactică şi Pedagogică, Bucureşti

[16] Georgescu, Gh., Banu, C., şi col., 2000 – Tratat de producerea, procesarea şi valorificarea cărnii, Editura Ceres, Bucureşti

[17] Grosu, H., Oltenacu, P., coordonatori ş.a., 2005 – Programe de ameliorare gnetice în zootehnie. Editura Ceres, Bucureşti

[18] Gregory, K.E., Cundiff, L.V., 1980 - Crossbreding in beef cattle. Evolution of systems. J. Anim. Sci., 51, 1224-1242.

[19] Lupan, V., Chilimar, S., Ujică, V., 1997 - Tehnologia creşterii bovinelor FEP " Tipografia centrală" Chişinau, Rep. Moldova.

[20] Lüdden, L., Temişan, V., Augustini, C., 1980 – Crossbreeding for Beef Production: Experimental Result. J. Anim. Sci., 51, p. 1197.

[21] Micol, D., 1986 – Production viande bovine, TEC- DOC, Lavoiser, Paris.

[22] Oroian, T., Vlaic, A., Cighi, V., Oroian, Elvira, Oroian, R.G., 2005 - Croisements entre les races Blanc Bleu Belges, Bălţată Romaine de Type Simmental et Brune. Buletinul USAMV–Cluj Napoca , 61, p. 26-30.
[23] Pântea, I., 1998 – Efectul încrucişării raselor autohtone cu tauri de rasă Blanc Belgian Blue şi aptitudinile pentru producţia de carne ale metişilor rezultaţi, Teză de doctorat, USAMV, Iaşi.
[24] Pierre, Mollieu, Joos, Caroline, 2006 - La Blanc Bleu Belge en croissement, Herd-book Blanc-Bleu Belge.
[25] Pipernea, N., 1979 - Imbunătăţirea structurii genetice a populaţiilor de animale. Editura Ceres, Bucureşti.
[26] Podar, C., Oroian, I., Péterfi, L., 2005 – Tehnologia "Vaca de carne" – o metodă ecologică de sporire a producţiei de carne de bovine în România, Revista Bioterra, nr.3, p.16–17
[27] Popescu Vifor, Şt., 1985 – Genetica procesului de dezvoltare la animale. Ed. Ceres, Bucureşti.
[28] Raicu, E., Popovici, D., Marinescu, Al., 1969 - Producţia de carne şi îmbunătăţirea ei. Editura Agrosilvică , Bucureşti.
[29] Sandu, Gh., 2006 - Metode experimentale în zootehnie. Ed. Carol Sanivet, Bucureşti.
[30] Stanciu, G, 1999 - Tehnologia creşterii bovinelor. Editura BRUMAR, Timişoara.
[31] Temişan, V., 1976 - Stadiul actual, programul, perspectivele ameliorării însuşirilor de carne a raselor de taurine din România. Teză de doctorat I.A. Cluj Napoca.
[32] Ujică, V., 1974 - Cercetări asupra creşterii taurinelor de rasa Brună de Maramureş şi a metişilor Holstein Frizã x Brună. Teza de doctorat, IA Cluj Napoca.
[33] Velea, C., 1972 - Cercetari comparative de îngrăşare semiintensivă a tineretului din diferite rase şi metişi crescuţi în România. Teza de doctorat, IA Cluj Napoca.
[34] Velea, C., Mureşan, Gh., Tapalagă, A., Buzan, V., 1985 - Îndrumător pentru creşterea şi îngrăşarea tineretului taurin. Ed. Ceres, Bucureşti.
[35] Velea, C., Mureşan, Gh., Bud, I., David, V., Vomir, M., 1993 – La dinamique des principaux indices de la production de viande a l'abattaje et en carcasse chez les jeunes taurins de la race Bălţată românească (Pie rouge roumanie). Buletinul I.A.C.N., vol. 44
[36] Vintila I., 1988 - Bazele ameliorării genetice a populaţiilor de animale domestice. Ed. Facla, Timişoara.
[37] Viziteu, C., 2009 – Contribuţii la îmbunătăţirea producţiei de carne la taurine prin folosirea încrucişărilor industriale cu rase de carne specializate. Teză de doctorat, USAMV Iaşi.