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Carcass Characteristics of Growing Male Pig in Different Level of Clenbuterol Addition

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Abstract **-** Nowadays, pig has becomes an important role in meat supply chain and demand in the world. However, in the intensive maintenance system, raising pig still has problems especially in feed supplements. The investigation on carcass characteristics of growing male pig in different level of clenbuterol addition in feed was conducted. CRD factorial 2 x 3 with 4 repetitions was used in the experiment. The first factor is the nation's pig (L = local pigs & pig off spring K=imports) and the second factor is the level of clenbuterol (T_0 = 0 mg/kg feed; T_1 = 0.20 mg/kg feed & T_2 = 0.40 mg/kg feed). The materials were 24 male grower pigs (12 local & 12 imported pigs) with 52.5 ± 28.27 kg body weight. Pigs were reared in individual cages for 6 weeks consisting 2 weeks for adaptation and 4 weeks for data collection. The pigs were given the same feed consisting of rice bran 27.8%, 55.5% and 16.7% corn concentrate. Feeding pigs was given in appropriate growth phase as much as 2 times a day. Drink provided using ad-libitum method. At the end of the study, the pigs were slaughtered. The meat was then analyzed based on the weight of the cut meat, weight of hot carcass, carcass percentage and carcass components (meat, bones and fat). The data was analyzed in variety followed by various orthogonal polynomial tests. Results shown that there were a real interaction between carcass weight and weight cut with quadratic pattern. Clenbuterol also found out to give an reduction effect on carcass percentage in both local and imported pig. In fact the local pigs give the lower carcass percentage than the imported one.

Key Words – *clenbuterol; weight cut; carcass percentag; carcass component*

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I. INTRODUCTION

Nowadays, pig has becomes an important role in meat supply chain and demand in the world. In 2012, the total dollar value of U.S. hogs/pigs, pork, and pig product exports set a new record high, which totaled $6.7 billion (USDA, 2013). However, in the intensive maintenance system, the raising of pig still has some problems especially in feed supplements. Application of science and technology are absolutely necessary in order to produce quality meat. Examples of compounds that can improve the quality and quantity of meat is β –adrenergic agonist, which one of its kind is clenbuterol, a chemical compounds that affect the β -receptors. Adipose tissue of most species consists of β-receptors which when activated will stimulate lipolysis. β -agonist was also effective in dividing the activity of certain agents, for example, alter or distort the available nutrients for the formation of fat toward protein accretion. Feeding cattle by β-agonist will stimulate the animal growth and carcass characteristics changes (Soeparno, 1994; Dilaga, 2012a; Dilaga, 2012b).

Indonesian native pigs originating from pig-wild boar that has been tamed, for example, Nias pig, pigs in Bali, Sumba pigs, pigs Krawang etc. (Wahyu & Supandi, 1969). The good quality of pigs imported from Indonesia is ever brought landrace, Yorkshire, Tamworth, Berkshire and Poland China (Sihombing, 1997). Crosses between local pig and pig imports are common. Pigs have a growing body of cross breeding and the use of feed that is better than local pig (Dilaga, 2012a).

The aim of this study was to investigate the carcass characteristics of boar meat growers in various levels of clenbuterol in the feed. From information obtained it can be

seen great benefits and the role of growth driver for the development of people's livestock industry and commercial farms in Indonesia specially and the world in common, which is associated with enhancing the quality and quantity of meat production and consumption of animal protein to the people.

II. EXPERIMENTAL

This research was conducted at the village of fattening Langensari Ungaran, Semarang regency, Indonesia. The research used 24 male pigs' grower pigs (12 local & 12 imported pigs) with body weight 52.5 ± 28.27 kg and 14–15 weeks old. Local pig breeders obtained from Kopeng, Salatiga, Indonesia, pig import off spring obtained from the company of the nation's commercial pig farm Landrace descent. Cage used a permanent individual cages made of cement concrete for floors and walls, a roof of tiles. The floor is made at a slight angle and each plot was given ditch enclosure for easy cleaning urine and feces.

Concentrate feed given coded K-52 made by PT Central Proteinaprima Semarang, Indonesia. The composition consisted of rice bran 27.8%, corn 55.5% and 16.7% concentrate with content of nutrients: water 8.61%, protein 14.96%, ash 7.62%, 5.48% fat, crude fiber 5.97%, 1.62% calcium, phosphorus 1.09% and energy metabolism of 2400 kcal/kg. Preliminary stage for 2 weeks was done to get used to the treatment of pigs and the environment, and eliminate stress from transportation. A week before the experiment started, all pigs were given de-worming. Implementation phase of treatment lasts for 4 weeks. Feed given 2 times a day in the morning and evening, according to the needs of pigs based on the phase of his life. Drinking water supplied in ad-libitum. At the end of the study the pig was slaughtered in Semarang Municipality (Dilaga, 2012a; Dilaga, 2012b).

Experimental design models CRD 2 x 3 factorials with 4 repetitions was used in this research. There are 2 factors, namely: (1) the pig (L = local pig & K = imported pig), (2) the level of clenbuterol (T_0 = 0 mg/kg feed; T_1=0.20 mg/kg feed and T_2 = 0, 40 mg/kg feed). The meat was then analyzed based on the weight of the cut meat, weight of hot carcass, carcass percentage and carcass components (meat, bones and fat). The data was analyzed in variety followed by various orthogonal polynomial tests.

III. RESULTS AND DISCUSSION

The average data of physical carcass characteristic include weight cut, weight of hot carcass, carcass percentage and carcass components (meat, bones and fat ratio) was shown in Table 1. Weight cut and carcass weight was proven to have an interaction in between and have a real effect ($P<0.01$). This means that there was a dependency between the observed parameters in order to generate response (in this case weight cut and carcass weight). Linear and quadratic interaction between level of clenbuterol addition and the origins of pig has shown a real effect, which both the local and imported pig showing the opposite tendency in variation level of clenbuterol addition. In local pig case, the weight cut tend to decline at the begining and then increasing at the high level of clenbuterol, while in imported pig case, of in the begining the weight cut tend to increase but then decreasing in the high level clenbterol addition.

Table 1. Physical Carcass Characteristics

Pig origins (L & K)	Level of clenbuterol (mg/kg feed)	Weight cut (kg)	Carcass weight (kg)	Carcass percentage (%)	Meat (%)	Bones (%)	Fats (%)
(L)		66.6	48.2	72.4	37.7	10.8	40.3
(K)		68.6	50.4	73.3	37.5	12.0	35.3
	0 mg (T_0)	70.7	52.6	74.6	31.8	10.5	45.7
	0.20mg (T_1)	70.3	48.1	72.5	36.9	11.9	33.2
	0.40mg (T_2)	65.9	47.1	71.5	44.0	11.9	34.5
(L)	0 mg	63.3 ^{ab}	47.3 ^{b}	74.9	28.9	10.6	45.2
	0.20 mg	70.4 ^{b}	51.6 ^{ab}	73.2	41.9	10.5	37.4
	0.40 mg	66.0 ^{bc}	45.7 ^{b}	69.2	42.3	11.3	38.4
(K)	0 mg	78.0 ^{a}	57.9 ^{a}	74.2	34.8	10.3	46.3
	0.20 mg	62.1 ^{c}	44.7 ^{b}	71.8	31.8	13.3	28.9
	0.40 mg	65.8 ^{ab}	48.5 ^{b}	73.8	45.7	12.5	30.7
CV		0.61	0.88	1.04	4.59	5.66	4.61
Lin. (Cl)		NS	*	*	NS	NS	NS
Kuad. (Cl)		NS	NS	NS	NS	NS	NS
Lin. (Cl v B)		**	NS	NS	NS	NS	NS
Kuad. (Cl v B)		**	**	NS	*	NS	NS

Description: L: local pigs, K: import pig offspring, CV: coefficient of variation, Lin. (Cl): linear effects of clenbuterol, Kuad. (Cl): quadratic effects of clenbuterol, Lin. (Cl v B): linear effect (Cl v B), Kuad. (Cl v B): quadratic effect (Cl v B), NS: not significantly different at the level of the test (α = 5%).
* is significantly different at (P<0,05)

The relationship between weight cut and level of clenbuterol addition in imported pig can be modeled in quadratic equation Y = 4.905 – 0.852 X + 1.449 X_2 (R_2 = 0.253) with minimum critical point (0.294 ; 4.780). On the other hand, the relationship between weight cut and level of clenbuterol addition in local pig can be modeled in polynomial quadratic equation Y = 4.784 + 0.687 X – 1.505 X_2 (R_2 = 0.4508) with maximum critical point (0.228 ; 4.863).

Result of investigation in quadratic interaction between level of clenbuterol and the origin of pig showing the real effect (P< 0.01). The relationship between carcass weight and level of clenbuterol addition in imported pig tend to decline at the begining and then increasing at the high level of clenbuterol and it can be modeled in quadratic equation Y = 4.763 – 1.057 X + 1.785 X_2 (R_2 = 0.241) with minimum critical point (0.296 ; 4.606). On the other hand, the relationship between carcass weight and level of clenbuterol addition in local pig in the begining tend to increase but then decreasing in the high level clenbterol addition and it can be modeled in polynomial quadratic equation Y = 4.631 + 0.700 X – 1.745 X_2 (R_2 = 0.633) with maximum critical point (0.200 ; 4.700).

Result of carcass percentage showed that imported pig was higher with 73.3% compared to local pig which only 72.4%. The addition of clenbuterol impacted to the decreasing of carcass percentage as follow: T_0 (74,6%), T_1 (72,5%) dan T_2 (71,5%). It can be stated that the addition of clenbuterol was linearly decreasing the carcass percentage for both pig origins, with modeled equation local pig and imported pig respectivelly Y = 1,857 – 0,211 X dan Y = 1,846 + 0,012 X. Carcass percentage were influenced by feed, sex, hormone, origin, weight and ages (Preston & Willis, 1974) and percentage of non-carcass component (Judge et al., 1989). The size of carcass are varied depend on pig origin, specially bones, meat and fat as shown in Table.1.

Carcass components consist of meat, bone and fat. Weight and percentage of meat, bone and fat were not significantly different among the origin of pigs, as well as between treatment showed no significant effect. The total weight of local pig are higher than the imported pig, while percentage of pig imports, while fat weight are smaller than the imported pig. Pigs that have a high carcass fat percentage tends to have a low meat and bone weight. Berg and Butterfield (1976) stated that the increase in the fat percentage will cause decreased in muscle and bone. According Tulloh (1978), the proportion of carcass components is influenced by age, origin, feed, illness and stress condition of the livestock.

Bone percentage decreased with increasing of weight cut. Bones as a support structure for the body is a fastest-growing component followed by meat and fat tissue (Forest et al., 1975; Berg and Butterfield, 1976). At various levels of clenbuterol treatment, the meat component is the most consecutive T_2 (44.8%), T_1 (36.9%) and T_0 (31.8%). This is in accordance with the opinion of Bermann et al. (1986) reported that the addition of cimaterol was able to increasing the retention to N to 40-80%, thereby giving an indication that the higher nitrogen retention in the body sirculation will actually increase the production of muscle tissue (Herbart et al., 1985).

The effect of interaction between levels of clenbuterol with the origin of pig showing a significant effect to the percentage of meat (P <0.05). The tendency of meat volume were increasing linear with the addition of clenbuterol for both pig origins. Relationship between the percentage of meat with clenbutero laddition in imported pig can be express in the following quadratic equation Y = 2.74 to 2.235 X + 5.821 X_2 (R_2 = 0.617) with a minimum critical point is (0.191; 2.525). At the local pigs, the relationship between the percentage of meat with clenbuterol level forming a polynomial equations with quadratic model equation Y = 2.589 + 1.784 X - 3.808 X_2 (R_2 = 0.344) with a maximum critical point is located at the point (0.234; 2,789).

Fat component from level of clenbuterol addition respectivelly T_1 (33,2%); T_2 (34,5%0 and T_0 (45,7%). This is similar to the result of the research conducted by Jones *et al.* (1985); Bermann *et al.* (1986) and Kim *et al.* (1988) which stated that cimaterol or *β-adrenergic agonist* may alter the composition of the carcass with an increase in muscle protein deposition as a result of the inhibition of lipogenesis or decreased carcass fat deposition. The use of *β-adrenergic agonist* will stimulate lipolysis in adipose tissue, it will get a little fatty meat (Ricks et al., 1984). The possibility of differences in the results obtained due to differences in initial weight, the origins, clenbuterol levels, and duration of β-AA addition, type of β-AA derivatives used, and also the feed limitation.

IV. CONCLUSION

In order to fulfill the meat supply and demand, the system production of pig or pig has to be efficient. Feed supplements should be improved to achieve the standard meat quality. The addition of clenbuterol as feed supplement was proven to have an effect on physical carcass characteristic. There were a real interaction between carcass weight and weight cut with quadratic pattern. Clenbuterol also found out to give a reduction effect on carcass percentage in both local and imported pig. In fact the local pigs give the lower carcass percentage than the imported one.

REFERENCES:

Berg, R.T. and R.M. Butterfield. 1976. New Concepts of Cattle Growth. Sydney University Press,. Sydney, Australia.

Beerman, D.H., D.E. Hogue, V.K. Fishell, R.H. Dalrymple and C.A. Ricks. 1986. Effects of cimaterol and fishmeal on performance, carcass characteristics and skeletal muscle growth in lambs. J.Anim. Sci. 62 : 370.

Dilaga, W.S., (2012a). Effect of clenbuterol on meat quality of growing male pig. J. Agric. Soc. Sci., 8: 29–33.

Dilaga, W.S., (2012b). The Effect of Clenbuterol on Growth Performance of Growing Male Pig. International Journal of Science and Engineering, Vol. 3(1):36-39.

Forest, J.C., E.D. Aberle, H.B. Hedrick, M.D. Judge and R.A. Merkel, 1975. Principle of Meat Science. W.H. Freeman and Company, San Fransisco

Herbart, F.F.D. Deb Hovell and P.J. Reeds. 1985. Some preliminary observation on the immediate effects of clenbuterol on heart rate body temperature and nitrogen retention in lambs. Wholly nourished by intra gastric infusion. Proc. Nutr. Soc. 44 : 1504.

Jones, R.W., R.A. Easter, F.K. Mc Keith, R.H. Dalrymple, H.M. Maddock and P.J. Bechtel, 1985. Effects of the ¬-Adregernic agonist cimaterol on growth and carcass characteristic of finishing swine. J. Anim. Sci., 61: 905–912

Judge, M.D., E.D. Aberle, J.C. Forrest, H.B. Hedrick and R.A. Merkel, 1989. Principle of Meat Science. Kendall Hunt Publishing Company, Dubuque

Kim, Y.S., Y.B. Lee, W.N. Garret and R.H. Dalrymple, 1988. Effects of cimaterol on nitrogen retention and energy utilization in lambs. J. Anim. Sci., 67: 674–681

Preston, T.R. and M.B. Willis. 1974. Intensive Beef Production. 2nd ed. Pergamon Press ltd., Oxfort-New York-Toronto-Sidney-Paris-Frankfurt.

Ricks, C.A., R.H. Dalrymple, P.K. Baker and D.L. Ingle, 1984. Use of β-Agonist to alter fat and muscle deposition in steers. J. Anim. Sci., 59: 1247

Sihombing, D.T.H., 1997. Knowledge for Pig Cattle, 1st edition. Gadjah Mada University Press, Yogyakarta (translated from Indonesian version).

Soeparno, 1994. Meat Science and Technology. 1st edn. Gadjah Mada University Press, Yogyakarta.

Tulloh, N.M. 1978. Growth, Development, Body Composition, Breeding and Management. A Course manual in beef cattle management and economic. W.A.T. Bowker, R.G. Dumsday, J.E. Frish, R.A. Swan dan N.M. Tulloh (Eds). Australian Vice-Chancellors' Committee. Academy Press Pty Ltd. Brisbane, Australia. Hal. 59 – 91.

USDA, 2013. World Agriculture Supply and Demand Estimates.

Wahyu, J. & Supandi, D. 1969. Pig Farming Guidelines. Faculty of Animal Science, Bogor Agricultural University. Directorate General of Livestock Services Press, Ministry of Agriculture, Jakarta.