IMPACT: International Journal of Research in Applied, Natural and Social Sciences (IMPACT: IJRANSS)
ISSN(P): 2347-4580; ISSN(E): 2321-8851
Vol. 5, Issue 4, Apr 2017, 39-42

BODY WEIGHT RESPONSE TO SEASONAL STRESS ANDANTIOXIDANTS

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ABSTRACT

The present experiment was conducted to study the body weight gain in the crossbred pigs (Hampshire × Local) under the agroclimatic condition of Assam. The experiment included a total of 36 numbers of crossbred weaned female pigs. Eighteen (18) animals were subjected to treatment separately during summer and winter. The selected animals were divided into three groups with six pigs in each group consisting of the control group (Treatment 1), one group was fed melatonin @3 mg/animal (Treatment 2) and the other group was fed Vitamin E @100 mg (Treatment 3) for both the seasons. The animals were maintained at AICRP on Pig, College of Veterinary Science, AAU, Khanapara, and Guwahati-22. Temperature-Humidity Index was calculated out from the data of ambient temperature and relative humidity by using standard formula. The Temperature Humidity Index (THI) during the study period was indicative of thermal stress to the experimental animals in the summer as compared to winter season. The mean body weight value in the three treatment groups during summer was found to be23.22 ±0.78 ^{A} whereas it was 25.61± 0.93^{B}during winter.

KEYWORDS: Antioxidants, Body Weight Gain, Seasonal Stress

INTRODUCTION

Swine are particularly susceptible to heat stress because they possess little to no functional sweat glands (Curtis, 1983). In addition, pigs maintain more subcutaneous fat and this prevents effective heat dissipation (Mount et al., 1979).

Heat stress is one of the wide varieties of factors which cause oxidative stress *in-vivo*. Reactive oxygen species (ROS), the major culprits for causing oxidative stress, are constantly generated *in vivo* as an integral part of metabolism. ROS may cause oxidative stress when their level exceeds the threshold value. They trigger progressive destruction of polyunsaturated fatty acids (PUFA), ultimately leading to membrane destruction. An antioxidant is a molecule that inhibits the oxidation of other molecules. Oxidation is a chemical reaction that transfers electrons or hydrogen from a substance to an oxidizing agent. Oxidation reactions can produce free radicals. In turn, these radicals can start chain reactions. When the chain reaction occurs in a cell, it can cause damage or death to the cell. Antioxidants terminate these chain reactions by removing free radical intermediates, and inhibit other oxidation reactions.

Body weight serves as a good marker of animal's adaptability for growth under extreme conditions of summer and winter seasons.

MATERIALS AND METHODS

Place of Work

The present study was carried out at the Department of Veterinary Physiology and AICRP on Pig, College of

Veterinary Science, Khanapara, and Guwahati.

Period of Work

The experimental study was carried out during two different seasons: Summer (June, July & August, 2014) and winter (December, 2013 & January and February 2014)

Experimental Design

The present experiment included 36 nos. of weaned, healthy and uniform sized crossbred (Hampshire X Assam local) female pigs. Eighteen (18) animals were subjected to treatment separately during summer and winter. The selected animals were divided into three groups with six pigs in each group consisting of the control group (Treatment 1), animals of one group was fed melatonin (Meloset) @3 mg/animal (Treatment 2) and the other group was fed Vitamin E (Evion) @100 mg (Treatment 3) for both the seasons. The animals were fed as per standard feeding practices of the farm. For identification of the animals, numbers were imprinted by trimming the body hairs.

The experimental design was approved by the Institutional Animal Ethics Committee, College of Veterinary Science, Assam Agricultural University, Khanapara, and Guwahati-781022.

Temperature-Humidity Index (THI)

Temperature-Humidity Index was calculated out from the data of ambient temperature and relative humidity by using the formula of Mader*et al.* (2006). The dry bulb temperature and relative humidity were recorded daily from June to August, 2014 and December 2013 to February 2015 from the Automatic Weather Station (AWS) installed in the College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati, where the experimental animals were reared. Temperature-Humidity Index was calculated for the entire period using the following formula:

$$THI = (0.8 \times Tdb) + [(RH/100) \times (Tdb - 14.4)] + 46.4$$

Body Weight

Body weight of the animals was measured in digital balance till four months after weaning.

RESULTS AND DISCUSSIONS

Temperature Humidity Index (THI)

The mean temperature humidity indexes of two different seasons were found to be 82.01±0.50 for summer season and 63.16±0.30 for winter season.

Body Weight (KGs)

The mean body weight values in the three treatment groups during summer and winter are presented in table 1 and 2. The mean body weight value in the three treatment groups during summer was found to be23.22 ±0.78^{A} whereas it was 25.61± 0.93^{B}during winter... Statistical analysis revealed significant difference ($P<0.01$) in the mean body weight values between treatment and between season. There was also significant difference ($P<0.01$) between day and season.

The present findings are in close association with the findings reported by Gyo-Moon Chu and Young-Min Soon (2013). They reported that the final body weight and average daily gain in fattening pigs were significantly lower ($P<0.05$)

in summer than in spring, autumn and winter and it was not different between spring, autumn and winter. The finished body weight in summer was 100.67 kg while that of spring, autumn and winter were 107.83, 107.17 and 107.83 kg respectively. On the other hand Korzeniowska*et al*. (2012) reported that the daily body weight gains of pigs finishing in winter season were lower as against those in the summer period by an average of 291.63 g in the first stage and 26.58 g in the second stage.

Quiniou and Noblet (1999) reported the effect of temperature on the variation in body weight. They reported an increased body weight loss in the multiparous lactating sows but its estimate chemical composition remained constant. Over the total lactation the body weight loss was significantly affected by temperature; it amounted to 23 kg at 18, 22 and 25°C on average but increased up to 36 kg at 29˚C, the value at 27°C being intermediate. A significant interaction between temperature and dietary treatment was observed in connection with a lower body weight loss at 25˚C. The effect of vitamin and trace mineral supplementation on the body weight gain in growing-finishing pigs was demonstrated by Tian*et al*. (2001). He reported that in the growing-finishing pigs during the overall experimental period (0-9 weeks, 54-106 kg body weight) growth performance was not significantly affected by dietary vitamin and trace mineral levels. During the first two weeks (21 to 30 kg body weight), average daily gain in the 200% mineral supplemented group was highest and lowest in 200% water soluble supplemented group ($p<0.05$).

The body weight gain in the three treatment groups during summer was lower than in winter which may be attributed to the effect of heat stress that hampered the body weight gain in summer. It may also be due to decreased feed intake which is commonly seen when animal suffers from thermal stress to maintain homoethermy and to counteract or lower the metabolic heat production ultimately leading to decreased weight gain. Within treatments in both summer and winter season the melatonin supplemented group was found to have better weight gain followed by vitamin E supplemented and then by the control group which gives indication about the stress relieving action of these antioxidants.

Table 1: Body Weight (KG, Mean± SE) in the Different Treatment Groups during summer and Winter Season

Season	Treatment	Day																Aggregate	
		0		15		30		45		60		75		90		105			
		Mean	± SE	Mean	± SE	Mean	± SE	Mean	± SE	Mean	± SE	Mean	± SE	Mean	± SE	Mean	± SE	Mean	± SE
Summer	1	10.25	0.02	12.40	0.14	16.15	0.10	20.36	0.25	24.65	0.16	29.10	0.07	33.06	0.15	37.63	0.40	22.95	1.35
	2	10.32	0.07	12.99	0.13	16.34	0.15	20.86	0.32	24.55	0.16	29.49	0.15	33.62	0.24	38.94	0.11	23.39	1.39
	3	10.32	0.05	13.01	0.08	16.25	0.16	20.51	0.20	25.12	0.11	29.59	0.20	33.37	0.24	38.39	0.18	23.32	1.37
	Aggregate	**10.30**	**0.03**	**12.80**	**0.09**	**16.25**	**0.08**	**20.58**	**0.15**	**24.77**	**0.10**	**29.39**	**0.10**	**33.35**	**0.13**	**38.32**	**0.19**	**23.22^{A}**	**0.78**
Winter	1	10.34	0.06	12.96	0.08	17.23	0.22	21.83	0.23	26.96	0.26	32.66	0.26	37.70	0.27	42.75	0.16	25.30	1.61
	2	10.25	0.09	12.92	0.08	17.74	0.21	22.38	0.23	27.99	0.16	32.90	0.20	38.28	0.20	44.07	0.22	25.81	1.66
	3	10.15	0.17	13.02	0.10	17.92	0.12	22.67	0.15	28.11	0.23	32.71	0.28	37.98	0.32	43.18	0.21	25.72	1.62
	Aggregate	**10.25**	**0.07**	**12.97**	**0.05**	**17.63**	**0.13**	**22.29**	**0.14**	**27.69**	**0.17**	**32.76**	**0.14**	**37.99**	**0.16**	**43.33**	**0.17**	**25.61^{B}**	**0.93**
	Overall	**10.30**	**0.03**	**12.80**	**0.09**	**16.25**	**0.08**	**20.58**	**0.15**	**24.77**	**0.10**	**29.39**	**0.10**	**33.35**	**0.13**	**38.32**	**0.19**	23.22	0.78

Values having same superscript do not differ significantly

Table 2: ANOVA for Body Weight in the Different Treatment Groups during summer and Winter Season

Source	Sum of Squares	df	Mean Square	F	P Value
Replication	1.387	5	.277	.245	0.942
SEASON	412.060	1	412.060	363.958	<.001**
Replication × Season	1.165	5	0.233	0.206	0.960
Treatment	12.442	2	6.221	5.495	0.005**
Season × Treatment	0.068	2	0.034	0.030	0.971
Day	30290.774	7	4327.253	3822.107	<0.001
Treatment × Day	8.648	14	0.618	0.546	0.904
Error	284.173	251	1.132		
Total	**31010.717**	**287**			

CONCLUSIONS

Seasonal stress caused due to the changes in environmental temperature has profound effect in the body weight of pigs which up to some extent can be overcome by the cell damage preventing action of antioxidants

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