

PHYSIOLOGICAL RESPONSES OF GROWING RAMS TO ASBESTOS SHADING DURING SUMMER

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Summary

Physiological reactions of 24 six months old (22.7 kg. body weight) Barki ram lambs, to hot summer conditions, as influenced by asbestos shading at Maryout area were studied.

Animals (12 shaded and 12 Unshaded) developed hyperthermia during summer as their rectal temperature (RT) and respiration rate (RR) were always higher ($p < 0.01$) than normal. Asbestos shading caused higher ($p < 0.05$) RT and RR (39.5°C and 69.9 r.p.m. vs. 39.2 and 45.7 r.p.m.) of rams at morning (6-8 a.m.) which became lower (39.9°C and 104.3 r.p.m. vs. 40.1°C and 120.5 r.p.m.) in afternoon (2-4 p.m.) as compared to sun exposure. Shading also resulted in higher hematocrit value (PCV) (35.3% vs. 33.0%) and lower ($p < 0.05$) daily weight gain (128.57 vs. 131.43 g).

Diurnal ($p < 0.01$) and monthly ($p < 0.05$) RT and RR changes were closely associated with air temperature (AT) fluctuations. Monthly variation ($p < 0.05$) in PCV was evident.

Puberty was reached one month later in the shaded as compared to the unshaded group (265 vs. 232.3 days, respectively).

It is concluded that asbestos shading prevents efficient heat dissipation to the sky by hyperthermic rams during summer nights. Construction materials for animal shelters are of extreme practical importance.

(Key Words: Sheep, Shading, Physiological Reactions, Puberty, Summer)

Introduction

High ambient temperature (AT) results in significant rises in rectal temperature (RT), respiration rate (RR) and percent packed cell volume (PCV %) in sheep, (Roman et al., 1978; Rathore 1975; Foote et al., 1957; Sano et al., 1979 and 1983; Shalaby, 1985; Younis et al., 1986; Abou-Ela et al., 1987).

There are monthly, and diurnal variations in these physiological responses to environmental heat (Hafez et al., 1956; Symington, 1960).

Under hot conditions, normal growth is retarded (Terrill, 1968; Hafez, 1968), probably due to depressed feed intake (Johnson et al., 1987), inhibited thyroid gland activity (Yousef and Johnson, 1966; Abou-Ela et al., 1987), and consequently depressed metabolism (Hardy, 1981).

Under such conditions spermatogenic activity

of rams is inhibited, (Rathore and Yeates, 1967; Rathore, 1968 and 1969; Gomes et al., 1971; Rathore, 1987).

Shading of animals is probably of some practical importance depending on the materials for construction (Kotby et al., 1987).

Materials and Methods

Twenty four six months old and 22.7 kg. average weight Barki ram lambs kept at Maryout Research Station, Desert Institute were used (mid-June through early October, 1981). Animals were randomly divided into two equal groups, an unshaded group and a shaded group maintained under an asbestos shed three meters high. A balanced ration was fed *ad libitum* while drinking water was available twice daily, at morning and late afternoon. Ambient temperature (AT, °C) was recorded using Mercury centigraded thermometers for shaded group, however to obtain the actual heat load on the unshaded animals, a bulb made of copper and painted in black (16 cm. in diameter), fixed with a thermometer was suspended at 1.5 meter from the floor, rectal temperature (RT, °C) was obtained by inserting

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the clinical thermometer (°C) for 6-8 cm in the rectum for one minute, respiration rate (RR, r.p.m.) was obtained by counting the flank movements for one minute and relative humidity (RH, %) was measured by the use of a hair hygrometer for both shaded and unshaded groups. All parameters were recorded twice a day at morning (6-8 a.m.) and afternoon (2-4 p.m.) once biweekly along with ml of blood samples from the jugular vein using a 2.5 ml syringe two hours after morning drinking. PCV% was determined by a microhematocrit centrifuge, body weight was recorded throughout the experimental period (15 weeks).

Sexual puberty was indicated by anatomical and histological studies of ram lambs genitalia.

Analysis of variance (ANOVA) and Duncan's Multiple Range Test (DMRT) were carried out on the data according to Snedecor and Cochran (1978).

Results and Discussion

Data on AT (°C), RH %, RT (°C), RR (r.p.m.) at morning (6-8 a.m.) and afternoon (2-4 p.m.) along with daily gain (DG) in weight (gm) and PCV% are illustrated, (figure 1), while differences in these physiological responses, due to shading, are summarized (table 1).

Considering RT (38.7°C ± 0.04) RR (24.7 ± 9.41 r.p.m.) during early October at 6-8 a.m. as

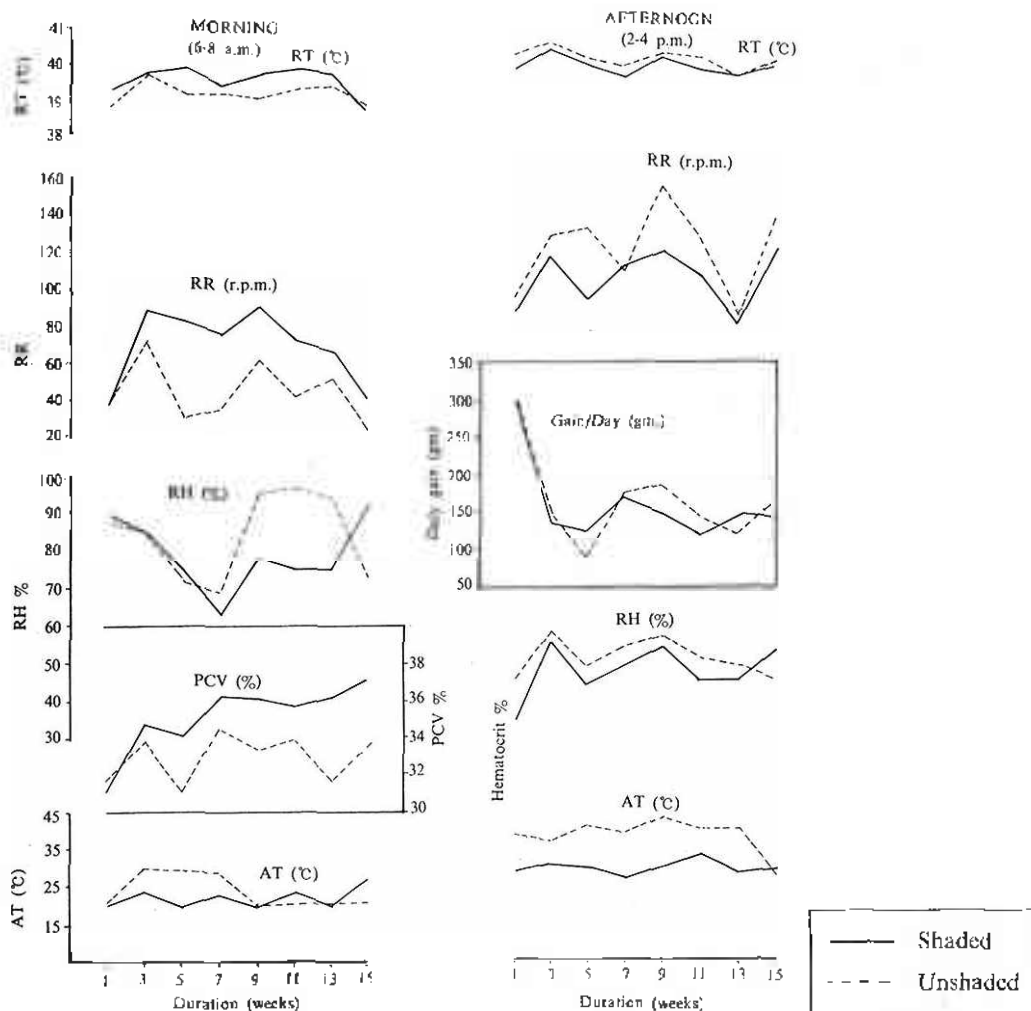


Figure 1. Diurnal climatic data and physiological responses of shaded and unshaded lamb rams.

ASBESTOS SHADING IN GROWING RAMS

TABLE 1. DIFFERENCES BETWEEN MORNING (6-8:00 A.M.) AND AFTERNOON (2-4:00 P.M.) CLIMATE, PHYSIOLOGICAL RESPONSES AND THEIR SIGNIFICANCE IN SHADED AND UNSHADED GROUPS DURING SUMMER

Time of day	Treatment	Weeks Parameters	1	3	5	7	9	11	13	15
Morning (6:00-8:00 a.m.)	Shaded	AT (°C)	-1.0	-6.0	-9.5	-5.5	6.0	+3.0	-1.0	+6.0
		RH (%)	+2.0	0.0	+3.0	6.0	-18.0	-22.0	-16.0	+20.0
		RT (°C)	+0.4**	+0.1 ^{NS}	+0.7**	+0.2 ^{NS}	+0.6**	+40.5*	+0.3 ^{NS}	-0.2 ^{NS}
		RR	+11.5*	+16.0 ^{NS}	+51.4**	+38.6*	+27.7*	+29.7**	+14.0 ^{NS}	+14.6**
Afternoon (2:00-4:00 p.m.)	Shaded	AT (°C)	-9.9	-6.0	-11.1	-12.0	-13.0	-7.0	-12.0	+2.0
		RH (%)	-12.0	-2.0	-5.0	-5.0	-3.0	-6.0	-4.0	+8.0
		RT (°C)	-0.4**	0.2 ^{NS}	-0.2 ^{NS}	-0.3 ^{NS}	-0.1 ^{NS}	0.3 ^{NS}	0.0	0.1 ^{NS}
		RR	-9.5 ^{NS}	-10.0 ^{NS}	-37.3**	+3.0 ^{NS}	-34.3*	-20.7*	-5.3 ^{NS}	-16.6 ^{NS}
Shaded		DG	-1.60**	-18.2**	+36.2**	-6.4*	35.7**	20.9**	+28.5**	23.7**
Shaded		PCV(%)	-0.6 ^{NS}	+1.1 ^{NS}	+3.1 ^{NS}	+1.6 ^{NS}	+2.9 ^{NS}	+1.7 ^{NS}	+4.6 ^{NS}	+3.6 ^{NS}

AT (°C) : Air temperature
 RH (%) : Relative humidity
 RT (°C) : Rectal temperature
 RR (r.p.m.) : Respiration rate
 DG : Daily gain (gm) in weight
 PCV : Hematocrit value

* : p < 0.05
 ** : p < 0.01
^{NS} : Non significant

normal, all animals exhibited higher ($p < 0.01$) than normal RT and RR throughout the experimental period. At morning RT and RR were higher ($p < 0.01$ and $p < 0.05$) most of the experimental period in the shaded as compared to the unshaded group. In the afternoon however, the shaded animals exhibited lower RT ($p < 0.01$ in the first week only) and also lower RR ($p < 0.01$ in the 5th, $p < 0.05$ in the 9th and 11th weeks). Diurnal, weekly and monthly changes in RT and RR were closely associated with AT changes, ($r = 0.625$) for RT and ($r = 0.740$), for RR. When AT was increased 1°C the RR increased 3.39 r.p.m. and RT increased by 0.037°C.

Asbestos shading appears to be helpful during the day but not during the night for decreasing the magnitude of hyperthermia in animals during hot summer months, as was reflected by physiological reactions. In agreement were results by Kotby et al. (1987) on Friesian cattle under Mid-Egypt conditions.

PCV% was always higher in the shaded group, although differences from the unshaded group lacked statistical significance, thus indicating some hemoconcentration within two hours after

drinking. Heat induced hemoconcentration in animals have been reported, (Roman et al., 1978).

DG in weight was depressed ($p < 0.01$) due to shading throughout the experimental period except in the 5th and 13th weeks, when DG was higher ($p < 0.01$), probably as a result of water retention by the body in the shaded group, since AT differences between shade and open air afternoon was 11-12°C during these two weeks. That hyperthermia results in drinking more water and also more water retention in the body have been documented (Kamal, 1975a,b).

Heat induced hyperthermia of animals inhibits growth, (Terrill, 1968; Kamal and Johnson, 1978).

The shaded group, animals exhibited signs of puberty one month later (265 ± 10.8 days) at 32.7 kg average body weight as compared to the unshaded animals (232.3 ± 10.8 days of age) at 32.5 kg body weight. Probably due to depressed DG with consequent growth retardation. Testicular spermatogenic function in rams is known to be inhibited under hot conditions (Moule and Waites, 1963; Rathore, 1987).

It is concluded that asbestos shading is not beneficial for rams during hot summer conditions in the Maryout area.

Construction materials for animal sheltering during hot summer are very important for efficient protection of animals.

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