EFFECT OF DIFFERENT RATIONS ON MATURITY OF SAHIWAL HEIFERS

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The influence of plane of nutrition on growth rate and age at puberty was studied on sixteen Sahiwal heifers of 14-21 months' age. They were divided randomly into four different groups. They were fed basal ration consisting of green berseem/sorghum and wheat straw supplemented with concentrates like undecorticated cotton seed cake, gram and guar meal respectively. The animals were kept on these feeding regimes for 290 days. The heifers in group supplemented with undecorticated cotton seed cake were the heaviest in weight at the end of the experimental period and got conceived earlier than those in other groups. Next in order of weight gains and conception age was group B fed gram. The group C fed on the basal ration supplemented with guar meal ranked third, while group D fed on basal ration consisting solely of green berseem/sorghum was the poorest in both these respects. It may thus be concluded that feeding of concentrates to growing heifers stimulates the growth and cause early maturity.

INTRODUCTION

A herd of high producing cows is of foremost importance for the economical milk production. One good method of developing a high yielding herd at a farm is by replacing the old and poor producers as soon as possible, with well bred farm raised heifers of higher productive ability. The generation interval of cattle ranges from 4 to 4½ years (Lush, 1945 ; Peterson, 1950). Hence care should be taken to select the replacements. The high producing ability of a cow is due to both the genetic potentialities as well as to good environmental conditions and feeding provided to her from birth to maturity. It is, therefore, essential to give high quality of well balanced rations to growing heifers of good breed which are kept for replacements. The present work was thus undertaken to study the effect of plane of nutrition on the growth rate and age at puberty in *Sahiwal* heifers used as replacements at the West Pakistan Agricultural University dairy farm.

REVIEW OF LITERATURE

Eckles (1935) observed that well fed heifers mature earlier than the poorly fed. Hawk *et al.* (1954) reported that inbreeding and other growth

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inhibiting factors increase age at maturity. Winters (1954) pointed out that larger breeds of cows mature slower than smaller breeds. MacDowell *et al.* (1959) reported that there is a tendency of increasing the age at maturity in crosses with increasing Red Sindhi blood. Caesard and Juergenson (1959) stated that Holstein, Ayrshire and Jerseys heifers could be successfully mated on achieving certain minimum body weights. Similar observations were recorded by Williamson and Payne (1959) in Red Sindhi heifers. Jubert (1963) reported that high plane of nutrition caused maturity within 234-808 days in cattle. He studied the average age at maturity of various cattle and reported that calving as early as 14 months in cows is possible. Winchester (1964) stated that lack of good green fodder, technical education and control on diseases and parasites were the major causes of late maturity in cattle in the tropics. The average age at maturity (first heat) in Sahiwal heifers was 807-1153 days at various farms, while in Red Sindhi and Thari it was 895 and 956 days respectively (Anonymous, 1964).

MATERIAL AND METHODS

Sixteen heifers of Sahiwal breed of 14-21 months age were selected from the herd of West Pakistan Agricultural University's Dairy Farm for this experiment. They were randomly divided into four groups (A, B, C, and D) of 4 heifers each. The basal ration consisted of green berseem/sorghum and wheat straw which were fed at the rate of 24 pounds and 8 pounds respectively. The animals in groups A, B and C were fed concentrates, *viz.*, undecorticated cotton seed cake, gram and guar meal at the rate of 2 pounds, 2.5 pounds and 1 pound per head per day respectively, in addition to the basal ration. The control group D received only green berseem/sorghum (35 pounds) and wheat bhoosa (5 pounds) per head per day according to Morrison Feeding Standard (Morrison, 1959). The body weight of each individual animal was checked early in the morning before feeding at the start of the experiment and then at weekly interval at the same day and time thereafter. Fresh and clean drinking water was available for the animals at all times. A lump rock salt was placed before each animal in the manger for free choice licking. The trial lasted for 290 days. A close watch on each animal was kept and the observations on the health and sign of heat were duly recorded. The date of conception (first heat) in each case was also noted. The age at conception was considered to be the age of maturity. The data on weight gain was subjected to statistical analysis by Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

The summary of the initial weight, initial age, final weight and age at conception of heifers fed different rations is given in Table 1.

TABLE 1. *Summary of weights and age at conception*

Group	Heifer No.	Initial weight (Lb.)	Final weight (Lb.)	Total gain in weight (Lb.)	Average gain in weight (Lb.)	Age at start of experiment (Days)	Age at conception (Days)
A	446	382	536	154		619	896
	493	348	508	160	158.50	619	680
	473	266	432	166		585	871
	468	330	484	154		612	929
B	472	368	550	182		585	892
	475	400	538	138	157.00	567	892
	474	348	516	168		545	890
	463	338	478	140		649	1042
C	488	344	608	120		435	*
	483	310	434	124	130.25	521	1054
	479	262	394	130		549	*
	467	300	447	147		519	10.49
D	485	310	380	70		484	*
	486	287	394	107	93.00	448	*
	491	344	447	103		421	*
	477	300	392	92		560	*

*Denotes that the heifer did not come in heat.

Weight gain.—It is evident from the data shown in Table 1 that heifers in group A receiving cotton seed cake (undecorticated) gained on an average 158.50 pounds during the experimental period whereas the animals in group B fed gram gained 157.00 pounds on an average. The average gain in weights of heifers in Group C receiving guar meal was 130.25 pounds whereas the animals in group D (control) gained only 93.00 pounds during the experimental period. The data indicate that the animals fed undecorticated cotton seed cake had better rate of growth than those fed other concentrates, gram and guar meal. The weight gain data was subjected to statistical analysis and the results are recorded in Table 2.

TABLE 2. *Analysis of variance on mean body weight gains of heifers supplemented with different concentrates.*

Source of variations ..	d.f.	S.S.	M.S.	F.	S.E.
Between groups ..	3	11289.69	3763.23	16.44*	7.56
Error ..	12	2745.75	228.81		
Total ..	15	14035.44			

*Denotes P<0.01 S. E. denotes Standard error.

The analysis showed that there was a highly significant difference among groups supplemented with different concentrates. The mean gains in weight on different concentrates used were further compared by Duncan Multiple Range Test (Duncan, 1955) given in Table 3.

TABLE 3. *Least significant values for comparisons of mean weight gains by Duncan Multiple Range Test.*

Level of significance		P	2	3	4
5%		S.S.R.	3.08	3.25	3.33
	(S.S.R.)	(S.E.)	22.28	24.57	25.17
1%		S.S.R.	4.32	4.55	4.68
	(S.S.R.)	(S.E.)	32.66	34.40	35.38

P=denotes protection level used by Duncan 1955.

TABLE 4. *Comparison of mean weight gains of heifers fed on different concentrates.*

Rations	Means	X 93.00	X 130.25	X 157.00
A	158.50	65.50**	28.25*	1.50 N.S.
B	157.00	64.00**	26.75*	..
C	130.25	37.25**	..	..
D	93.00	..	..	..

*Denote P<0.05.
**Denote P<0.01
N.S. denotes Non-significant.

The results of the comparison shown in Table 4 indicate that animals in groups A and B differed significantly (P<0.05) from those in group C in respect of weight gains. The weight gain of animals in group A did not differ significantly from those in group B. But heifers in group D (control) had significantly (F<0.01) lower weight gain than those in group A, B and C. The data thus indicate that green fodder and wheat straw (*bhoosa*) are not adequate in promoting rapid growth in young growing heifers even though fed amounts according to the requirements and hence such ration must be supplemented with

some cheaper concentrate to get better results in respect of quicker weight gains.

Age at conception (*Maturity*). Gilmore (1952) defined maturity, the age at which heifer is able to conceive when mated to a fertile bull, while it has been defined as the age when first heat appears (Anonymous, 1964). In this study the age of maturity was taken at the age at which first heat appeared. As is evident from the data shown in Table I, all the heifers in group A and B supplemented with undecorticated cotton seed cake and gram respectively conceived at an average age of 844 days and 929 days respectively, while only two animals in group C fed guar meal conceived at an average age of 1051 days. None of the heifers in Group D (control) fed on the conventional ration consisting of green and dry roughage showed any sign of heat. The data further showed that the animals in group A matured earlier than those in other groups. The age of maturity in Sahiwal heifers used in this study ranged from 680 to 1054 days.

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