Supplementary feeding of Working donkeys : influence of plane of nutrition on body condition and levels of blood metabolites

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SUMMARY

Observations on effects of nutrition and draft stress were made on a total of 11 donkeys divided in two groups (G1 = 5 animals; G2 = 6 donkeys) for a period of 22 weeks. Donkeys in G1 (non supplemented) were maintained in a traditional grazing pattern, i.e. allowing them to graze on low quality unimproved pastures from 7.00 a.m. to 4.30 p,m. The second group (G2, supplemented) were grazed in the same manner but upon return from grazing they received 1.8 kg of concentrate containing about 15 MJ DE/kg DM and 17.7% Crude Protein. Body weight and condition scores were recorded once every two weeks.

On day 145 and for 3 weeks thereafter all donkeys were assigned to draught work of pulling loaded carts, the loads weighing 3 times their body weight. Data on blood levels of Glucose, Non-esterified fatty

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acids (NEFA) and Total Plasma proteins (TPP) were recorded from blood samples drawn at 15 minutes intervals over a period of 3 hours of continous work.Donkeys in both groups showed a steady increase in body weight with those in G2 registering significantly ($P< 0.05$) higher final weight (146.5 vs 141.0 kg). There were no significant differences ($P<0.05$) in body condition scores between the supplemented and the non supplemented donkeys.

Plasma Glucose concentration fell from 4.04±0.2 mmo1/1 to 3.07±0.3 in the supplemented group (G2) and from 4.06±0.6 mmo1/1 to 2.8±0.3 mmo1/1 in the non-supplemented group (G1) after three hours of work. The level of NEFA increased from 0.34±0.02 pmo1/1 to 0.52±0.06 pmo1/1 in non supplemented group (G1) and from 0.29 [imo1/1 to 0.39±0.03 1..tmo1/1 in the supplemented group (G2) after 3 hours of work; the difference between groups being highly significant ($P<0.001$). The TPP concentration of G2 donkeys remained the same throughout the working period whereas that of G1 donkeys increased significantly ($P<0.05$) within 2 hours of work and thereafter remained significantly higher than that of G2 donkeys.

It was concluded that donkeys subjected to draft work require supplemental feeding even where changes in body conditions are not obvious.

INTRODUCTION

The traditional feeding system for donkeys in Tanzania is primarily based on the use of roughage. Donkeys usually given access to communal grazing as last priority species, often foraging on areas already grazed by other stocks. With the exception of donkeys in Zanzibar practically no supplemental feeding is offered to donkeys in

Tanzania (personal observations). Where stall feeding is practised little attention is paid to the quality or quantity of feed given to donkeys.

It is generally assumed that donkeys are better able than other stocks to utilise low quality forages to meet their maintenance requirements (Tisserand, 1991). However, where donkeys have to perform energy demanding duties it is not likely that the type of diets given to them would be adequate to meet their requirements.

Apart from the studies by Kingamkono (1997) there is no information regarding the adequacy of the traditional feeding systems in meeting the donkey's energy demand for the different draft assignments they are often subjected to. The studies by Kingamkono (1997) clearly demonstrated that donkeys given modest levels of supplemental feed could sustain comparatively better energy status (judged by blood metabolite levels) than those receiving no supplements. ffowever, both suppl'errrefrkd acrd *suppkmeatefi* donkeys when worked for two hours maintained comparatively similar body conditions despite their significant differences in blood metabolite levels. It is not clear if this situation :could be sustained in donkeys working for longer hours.

Donkeys are usually worked for periods longer than two hours regardless of their body conditions. The present study iS an extension of the work by Kingamkono (1997). It attempts to investigate the influence of supplementary feeding on donkeys that are kept at strenuous activity for an extended period of time and is part of a series of studies aimed at developing strategic plans for supplemental feeding for working female donkeys.

MATERIALS AND METHODS

A total of 11 donkeys were used in this experiment. The donkeys (all females) weighing between 140 to 143 kg were divided in two groups (G1 = 5; G2 = 6 animals) and observations on their body weight and body conditions were made over a periOd of 22 weeks.

Donkeys in Gl were allowed to graze in the traditional system of 8 hours per day. Those in G2 were given access to the same field as GI donkeys for the same period of time and upon return from grazing they were offered 1.8 kg of concentrates. The concentrate given was formulated to contain 15 MJ DE and 17.7% crude protein. The dominant pasture species on the field were *Hyperrhenia spp, Sporobolus spp and Cynodon spp.* Some scattered bushes of Acacia were also present.

Body weight (empty body weight)and conditions scores (on the ascending scale of 0-5) were recorded once every fortnight.

Voluntary feed intake from pastures was estimated by live weight differences before and after feeding taken on each fortnightly occasion when weight and conditions were scored.

On day 145 and for 3 weeks thereafter donkeys from groups were assigned draft work of pulling loaded carts for three continuous hours. The loads were limited to 3 times the body weight of each individual. ***Blood sampling:***

Blood samples were drawn from the jugular vein before the commencement of the exercise and at 15 minutes intervals throughout the 3 hours of work. Plasma was separated from whole blood by centrifugation and analysis were made on the plasma for glucose (GL), total protein (TPP) and non-esterified fatty acids (NEFA). The analytical scheme of RANDOX was used for all parameters.

Data analysis:

The data collected were statistically analyzed using the SAS (1988). General Linear Model. Comparisons of metabolite profiles were made between the groups using mean values for each donkey for each time of sampling. Body condition scores were assesed as group averages taken once every fortnight.

RESULTS AND DISCUSSION

Table 1 gives a summary of observations on the effects of supplementary feeding on voluntary intake, body weight and condition score. It can be observed that voluntary intake from pastures for the two groups was similar. Animals in both groups consumed on average 3.6-4.2 kg of dry matter per day, equivalent to about 2.5-3.0% of their liveweight. This level of intake is similar to that reported by Raymond (1995) for non working donkeys of the same range of live weight and it corresponds to the levels suggested by Pearson and Merrit (1991) and Svendsen (1986). Donkeys in G2 received additional 1.8 kg of concentrates which partly explains their superior liveweight by the 22 week. Despite the additional concentrate given to G2 animals, there were no significant difference in the condition scores between the two groups. Similarities in condition scores were sustained throughout the 22 weeks of feeding, suggesting that body reserves for the two groups were similar at the 22 week when the animals were subjected to draft assignments. It was initially thought that the natural pastures on to which the donkeys were grazed were inadequate to meet energy demands of non working donkeys. Results from this study would suggest that the theoretical energy demand for maintenance of non working donkeys as reported by MacCarthy (1986) are probably an

overestimate for the local donkeys in Tanzania. Studies on Zebra grazing on savannah suggest that tropical equines possibly have less energy demands than their temperate counterparts because of their superior muscular economy (Van Soest, 1994). The pastures available at the time of this experiment appear to have been of adequate quality for non working donkeys and there may have been no need for the additional concentrates. Similar observations were reported by Kingamkono (1997).

Table 2 shows the effects of work on blood levels of various metabolites after 22 weeks of experimental feedingAt can be observed that there were no significant differences in the levels of plasma glucose between the two groups of donkeys. However, when the two groups were' ubjected to 3 hours of work plasma glucose levels increasd significantly to reach a peak of 4.7±0.2 mmo1/1 within 45 minutes for the supplemented group and to 4.3±0.3 mmol/1 within 30 minutes for the unsupplemented group. Thereafter, a gradual decline in plasma glucose was observed in both groups reaching a minimum of 2.7 mmol/1 by 165 minute for the supplemented group and 2.8±0.3 mmo1/1 by the 180 minute for the non-supplemented group. Plasma non-esterified fatty acids (NEFA) for the two groups did not differ. When subjected to work the NEFA levels increased in both groups but reached a significantly higher level among the non. supplemented (0.52±0.06 vs 0.3 9±0.03 imol/1) than for the supplemented group. For the total plasma proteins (TPP) the levels before subjecting the animals to work were similar for the two groups. During the three hours of work, the TPP concentration in the supplemented group did not show any notable change from readings taken before assigning the donkeys to work whereas in the non supplemented group TPP levels increased from 68.8 g/1 to reach a peak of 72.6 g/1 after 120 minutes of work. The increase of TPP concentration in non supplemented

donkeys were highly significant ($P<0.001$) compared to the levels recorded in unspplemented donkeys.

Comparatively similar level of blood metabolites before the donkeys were subjected to work corroborates the suggestions above that non supplemented donkeys were able to meet their maintenance requirements from grazing. However, the significant upward shift of NEFA and TPP shortly after the onset of work for the non-supplemented donkeys would suggest that grazing alone could not sustain energy demands for work. The lower TPP and NEFA values in supplemented donkeys may indicate that animals in this group were able to draw most of the required energy from the diet and there was little need for catabolizing endogenous sources to meet instantaneous energy required for work. However, it could not be established if this situation could be sustained for an extended period of time.

Animals in this experiment were subjected to work for only 3 hours and were assigned to pull loads equivalent to just three times their liveweight. This duration of work is much lower than that is expected of donkeys under traditional management. The assigned load was only a fraction of the recommended loads for donkeys pulling carts (Wilson, 1981; Inns, 1980). It may be expected that clear differences between G1 and G2 donkeys could have been demonstrated had the donkeys been subjected to the full recommended levels of work.

Findings from this study suggest that supplementary feeding for working donkeys is essential even where the donkeys appear to be in good body condition. It is also essential to plan supplementary feeding in a manner that minimizes the need for it during times when pasture conditions are adequate.

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