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تقويم عدد من أصناف سورجم العلف تحت ظروف المنطقة الوسطى بالمملكة العربية السعودية

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(٥٧)

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في تجربة حقلية لمدة عامين تمت مقارنة أربعة أصناف من سورجم العلف من حيث الانتاج العلفي وهي بايبر من حشيشة السودان وصنف سوبر دان هجين حشيشة السودان وصنفان هجينان بين النزه الرفيعة وحشيشة السودان هما جامبو وسبيد فيد في محطة الأبحاث والتجارب الزراعية ، جامعة الملك سعود قرب مدينة الرياض .

أشارت النتائج الى وجود اختلافات معنوية بين الأصناف من حيث كمية المادة العلفية الجافة وبعض صفات المحصول ذات العلاقة بالانتاج العلفي . أعطى صنف سوبر دان أعلى كمية من المادة الجافة وكان ذا متوسط عال من معدل الانتاج العلفي (كيلو غرام / هكتار/ يوم) وامتاز بسوق دقيقة، تلاه في الانتاج صنف جامبو الذي أعطى أعلى نسبة من وزن الأوراق الى السوق، كما امتاز باتساع المساحة الورقية للنبات . أعطى صنف بايبر انتاجا علفيا أقل من سوبر دان وجامبو ولكنه امتاز بقدرته العالية في تكوين الأشطاء وانخفاض سمك سوقه . وقد كان صنف سبيد فيد أننى الأصناف انتاجا من المادة الجافة .

APPARENT DIGESTIBILITY OF DISCARDED DATES AND DATE PITS TOGETHER WITH OTHER AGRICULTURAL BY-PRODUCTS

(58)

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ABSTRACT

A digestibility trial was conducted using yearling intact Awassi lambs to determine the apparent digestibility of discarded date and date pits together with some agricultural by-products and alfalfa hay as a control. Since discarded dates can not be fed alone to ruminants without causing digestive troubles and because of the low palatability of date palm leaves, the by-products studied have to be fed to animals with alfalfa hay to estimate digestibility. The three by-products date palm leaves, wheat straw and date pits were mixed with alfalfa hay in a 50:50 ratio while discarded dates were mixed with alfalfa hay in smaller proportion which amounted to no more than 1:2. It should be mentioned also that date palm leaves and wheat straw were previously treated with aqueous ammonia NH_3 to improve their quality. Results indicated that the apparent digestibility coefficients for dry matter (DM) organic matter (OM), crude protein (CP), crude fibre (CF) in the control (I), date palm leaves (II), wheat straw (III), discarded (IV), and date pits (V) respectively, were: DM 57.57, 41.00, 44.19, 87.43, 69.53; OM, 60.50, 45.59, 47.80, 89.38, 71.44; CP, 70.63, 22.03, 25.57, 20.75, 36.03; CF, 46.12, 43.44, 60.09, 38.30, 52.48. As for total digestible nutrients (TDN) and digestible crude protein (DCP), they were calculated for the feedstuffs I-V, respectively, as follows: TDN 53.52, 40.27, 47.80, 87.24, 73.19; DCP, 8.82, 1.79, 1.8, 6.5, 2.88. The results demonstrated clearly that discarded dates and date pits outperformed all the other by-products investigated and even the control as feeds for ruminants.

Key Words: Agricultural by-products, Date pits, Ruminant feeds

INTRODUCTION

Saudi Arabia is considered as one of the world's major date producers. In 1991 the total production of dates was estimated to be more than 0.5 million

metric tons (MAW, 1988). Limited quantity of this amount has been processed and packed in some governmental and private processing plants. Some of the low quality dates, the discarded dates of the processing plants and dates from the previous year, which are unsuitable for humans consumption, are available in considerable amounts to be used as a feed stuff for farm animals. The estimat-

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ed available amount of this dates by-product was predicted to be about 44,590 tons for the year 1992 (Al-Yousef et al 1993). In addition to that, date pits that represent 10% of the whole date fruits could also be considered for the same purpose.

Date palm leaves is another agricultural by-product that may have the potentiality to be utilized in ruminant diets. The source of these materials is the date palm trees that were estimated to be 12 million. The predicted amount of the usable portion of collectable leaves for the year 1992 was estimated to be in the range of 57800 metric tons (Al-Yousef et al 1993).

Wheat straw is the field by-product of wheat grain production. This material is widely used as a roughage for ruminants, and since Saudi Arabia is also considered as one of the major wheat producing countries, wheat straw is available locally in abundance and at relatively reasonable price. The estimated quantities of wheat straw as predicted by the authors for the year 1992 amounted to about 2.5 metric million tons (Al-Yousef et al 1993).

In this study, the four above mentioned by-products viz. discarded dates, date pits, date palm leaves and wheat straw were evaluated nutritionally to determine their potentiality as digestible feedstuffs for ruminant animals.

MATERIAL AND METHODS

Wheat straw and date palm leaves were chopped in a hammer mill prior to their treatment with ammonia at a rate of 4% of the treated, dry matter weight,

while water was added to represent 50% of the dry matter of the by-product. Treated materials were stored in plastic-lined bins, tightly covered for 21 days to allow the chemical reaction to take place. Twenty four hours before feeding to animals, the treated roughage were allowed to aerate in order to get rid of the strong ammonia smell.

The three by-products, crushed date pits, the ammonia treated wheat straw and date palm leaves were individually mixed with alfalfa hay in a 50:50 ratio before being fed to sheep. On the other hand, the minced discarded dates were only mixed in a smaller proportion (1:2) to avoid any digestive disturbances that could result from the high level of dates in ration (Table 1).

Five Awassi rams of about 8 months of age (weighing between 30-50 kg) were used for each diet. Animals were housed in metabolic crates.

The experiment started with a 10-day preliminary period in which no faeces were collected (Lloyd, et al 1956). After the 10-day preliminary period, the collection period followed and continued for 7-days. Feeds were offered once daily at 8 a.m, just after the collection of any feed residues. Subsamples from the feed given to each animal were taken everyday during the weighing and the residue collected from each ram was weighed daily and stored.

Total faeces excreted by each animal were separately collected every day at 7:30 a.m. Faeces were immediately weighed and a sample of 15% was weighed in an oven tray for dry matter determina-

Digestibility of discarded dates

Table 1. Formulation of the diets fed in the digestibility trial (DM basis)

| Ration no. Ingredients | 1 | 2 | 3 | 4 | 5 |
|---------------------------|-----|------|----|----|----|
| Alfalfa hay | 100 | 66.6 | 50 | 50 | 50 |
| Discarded dates | - | 33.4 | - | - | - |
| Wheat straw | - | - | 50 | - | - |
| Date palm leaves | - | - | - | 50 | - |
| Date pits | - | - | - | - | 50 |

tion. The dry matter was estimated by a unitherm oven at 105° C for 24 hours.

The dried samples of feeds, residues and faeces were ground in a Christly Orris mill using a 0.8 mm sieve. Ground dried samples were redried before weighing for proximate analysis.

RESULTS AND DISCUSSION

Discarded date and date pits can not be fed to animals alone because of their laxative effect and low palatability. They have to be provided to animals with a more common feed such as alfalfa hay. On the other hand, ammonia treated date palm leaves and wheat straw are palatable enough to be fed on their own without the need for any supplementation. However, since the two other by-products were fed with alfalfa hay, it is more valid to compare all by-products under the same conditions, thus feeding them all in combination with alfalfa hay.

The reason for feeding alfalfa hay with the by-products is that this feed in question is of high palatability and rich in crude protein. Moreover, alfalfa hay is the most widely grown forage crop in the Kingdom and known to have favorable influence on the digestibility of poor quality roughage. Since the by-products were fed as part of the diet containing also alfalfa hay, their apparent digestibility have to be calculated on the assumption that the digestibility of alfalfa hay was unaffected by being included with the other material, thus allowing the calculation of the digestibility of the added by-product by difference. No doubt, estimation of digestibility by difference represents a problem in case of the presence of an associative effect between feeds. However, the determination of digestibility in the manner described represents a real life situation to measure digestibility because none of these by-products are envisaged to be fed along to animals.

Table (2) shows the proximate analysis of the different ingredients utilized in the digestibility trial. Data indicated that all by-products studied even the ammonia treated ones were lower than alfalfa hay in crude protein content. Accordingly, it was no surprise, that all of by-products had benefitted from their inclusion with alfalfa hay. The highest increase in crude protein level was obtained when the control was mixed with discarded dates. The reason for this phenomenon was that the control was added to discarded dates to represent not only 50% of the diet as happened with the other by-products but 66%. The feeding of discarded dates was limited to 33% only of the diet out of fear that it might cause digestive troubles. As for the crude fibre content, the treated wheat straw and date palm leaves were evidently the highest in this respect, whereas, discarded dates showed the lowest crude fibre percentage and factually the amount of crude fibre in this by-product was quite negligible relative to the other ones tested. Reference was made for the crude protein and crude fibre and not to other nutrients, because of the greater influence of these two feed components on digestibility.

Results in Table (3) illustrate that the apparent digestibility of by-products dry matter and its constituents. Discarded dates demonstrated the highest dry matter digestibility and out performed ($P < 0.05$) the control (alfalfa hay) and the date palm leaves, least digestible, by 30 and 40 percentage units, respectively. Date pits were the second best in dry matter digestibility though significantly lower than discarded dates in this regard.

Concerning the dry matter digestibility in the other two by-products, it was digested to a greater extent ($P < 0.05$) in wheat straw than date palm leaves (44.19 VS 41.00). However, both of them treated alfalfa hay in this connection. The present finding with regard to ammoniated wheat straw dry matter digestibility coincides with that reported by Gordon and Chesson (1983) who gave a value of 43.8% for the concerned parameter.

The figures recorded for organic matter digestibility were higher than those of dry matter in all by-products and alfalfa hay. The greater digestibility could be explained from the fact that organic matter does not include the ash fraction which appear to be mostly unavailable to the animal, particularly if the feedstuff is contaminated with soil. Also, the organic matter digestibility of all different feed stuffs followed the same pattern as that observed in the case of dry matter digestibility.

The data on crude protein pointed out that alfalfa was patently the best in digestibility relatively to the by-products under investigation. This result was in line with our expectation, because, the crude protein digestibility depends mainly on the protein content of the feedstuff (McDonald et al 1981). Alfalfa hay was the richest among the feedstuffs investigated in crude protein content and so it was not surprising that it outclassed them in the digestibility of this nutrient. Date pits were the second best with regard to the digestibility of this nutrient. However, the figure obtained for its digestibility was almost half of that recorded for alfalfa hay (36.03 vs 70.63%). Perhaps, it

Digestibility of discarded dates

Table 2. Chemical composition (% DM) of the by-products and alfalfa hay and their combination fed in the digestibility trial

| Component item | Dry matter | Crude protein | Crude fibre | Ether extract | Nitrogen free extractive | Ash % |
|------------------------------------|------------|---------------|-------------|---------------|--------------------------|-------|
| By-products and alfalfa hay alone: | | | | | | |
| Alfalfa hay | 91.81 | 12.49 | 30.06 | 1.68 | 42.46 | 13.31 |
| Date palm leaves ammoniated | 48.72 | 8.14 | 36.64 | 1.94 | 40.06 | 13.22 |
| Wheat straw ammoniated | 47.56 | 7.04 | 36.90 | 0.51 | 40.89 | 14.66 |
| Discarded dates | 86.37 | 2.39 | 1.81 | 0.00 | 93.90 | 1.90 |
| Date pits | 92.27 | 6.06 | 12.01 | 7.99 | 72.88 | 1.04 |
| By-products + alfalfa hay | | | | | | |
| Date palm leaves ammoniated | 70.56 | 10.63 | 33.97 | 1.81 | 40.38 | 13.21 |
| Wheat straw ammoniated | 68.93 | 11.57 | 34.83 | 1.09 | 38.88 | 13.63 |
| Discarded dates | 89.98 | 9.24 | 19.64 | 0.98 | 63.19 | 6.95 |
| Date pits | 91.30 | 9.27 | 23.22 | 4.07 | 55.43 | 8.01 |

Table 3. The mean apparent digestibility coefficients (%) of the components of the by-products and alfalfa hay

| Component Feedstuff | % Apparent digestibility coefficients | | | | | |
|-----------------------------|---------------------------------------|-------------|---------------|-------------|---------------|--------------------------|
| | Dry matter | Org. matter | Crude protein | Crude fibre | Ether extract | Nitrogen free extractive |
| Alfalfa hay | 57.57 | 60.50 | 70.63 | 46.12 | 25.20 | 69.68 |
| Date palm leaves ammoniated | 41.00 | 45.59 | 22.03 | 43.44 | 21.41 | 53.99 |
| Wheat straw ammoniated | 44.19 | 47.80 | 25.57 | 60.09 | 24.63 | 57.60 |
| Discarded dates | 87.43 | 89.38 | 20.75 | 38.30 | 0.60 | 91.64 |
| Date pits | 69.53 | 71.44 | 36.03 | 52.48 | 60.85 | 73.68 |

is useful to mention at this juncture that alfalfa enjoys the reputation of being one of the best forages available worldwide because of its superior digestible crude protein content. However, all other by-products under study were deficient in crude protein even after treatment with ammonia and therefore, they have to be supplemented with alfalfa before being fed to productive ruminant animals. The date pits crude protein digestibility reported by other investigators varied from zero (El-Shazly et al 1963) to 38.6% (Al-Kinani, 1974).

The crude fibre digestibility of wheat straw showed the highest value followed by date pits, alfalfa hay, date palm leaves and discarded dates in order. Since the crude fibre constitutes a substantial proportion of the dry matter in wheat-straw and date palm leaves, its greater digestibility particularly in the former product will no doubt, decides more than any other factor their use as feedstuffs. The crude fibre in wheat straw was even more digestible ($P < 0.05$) than that found in alfalfa hay. Two factors could account for this observation. Firstly, alfalfa hay utilization is accompanied by a lower pH in the rumen that could lower the digestibility of the crude fiber (Horton and Nicholson, 1981) and secondly, the treatment of wheat straw with ammonia was known to break the phenolic bonds between the cellulose and lignin (Klopfenstein et al 1972) and the cellulose free of lignin is quite digestible by ruminant animals (Blaxter, 1967).

The digestibility of the nitrogen free extractives (NFE) followed the same ranking order as that noticed for dry

matter digestibility (discarded dates, date pits, alfalfa hay, wheat straw and date palm leaves in order). This could suggest that discarded dates was superior in NFE digestibility to all the by-products tested including the control (alfalfa hay). It is pertinent to recall here that more than 99% of the energy value (TDN) of the discarded dates was obtained from its NFE content. The results clearly indicated also that date pits surpassed ($P < 0.05$) alfalfa hay in NFE digestibility. As for wheat straw and date palm leaves, they yielded the lowest NFE digestibility among the feed ingredients tested with wheat straw turning to be the best compared to date palm leaves.

The TDN values presented in Table (4) are universally used as a measure of the digestible energy of the feedstuffs rather than just a measure of their digestible nutrient content, since the higher energy value of ether extract is accounted for. Also, digestible crude protein is widely accepted as a parameter to evaluate feeds as sources of protein for ruminants. Based on this understanding the values of these two measures were calculated for the by-products under study (Table 4).

In case of the digestible nutrients, the control was by far ($P < 0.01$) the most outstanding in this respect. The value revealed by alfalfa hay was found to be higher than that provided by all the four by-product combined. However, it goes without saying that the potentiality of the tested by-products as feeds will depend almost entirely upon energy and not their protein content.

Digestibility of discarded dates

Table 4. Total digestible nutrients (TDN) and digestible crude protein of the by-products and alfalfa hay

| Content | TDN % | Digestible crude protein |
|-----------------------------|-------|--------------------------|
| Alfalfa hay | 53.22 | 8.82 |
| Date palm leaves ammoniated | 40.27 | 1.79 |
| Wheat straw ammoniated | 47.80 | 1.80 |
| Discarded dates | 87.24 | 6.50 |
| Date pits | 73.19 | 2.88 |

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الهضم الظاهري للتمور المستعبده ونواها مع المخلفات الزراعية الأخرى

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تم اجراء تجرية هضم باستخدام أغنام العواسى لتحديد الهضم الظاهري للتمور المستعبده ونواها مع المخلفات الزراعية الأخرى ودريس البرسيم كعلف مقارن، حيث أنه لا يمكن تغذية التمور المستعبده منفردة للحيوانات المجتره دون تسببها لضطرابات هضمية وكذا انخفاض استساغة سعف النخيل.

لذا فان المخلفات تحت الدراسة لابد لها أن تغذى للحيوانات المجتره مع دريس البرسيم لتقدير معاملات هضمها ثم خلط الثلاثة مخلفات : سعف التمور وتبن القمح ونوى التمور مع دريس البرسيم بنسبة ٥٠ : ٥٠ ، بينما تم خلط التمور المستعبده بنسبة أقل حيث بلغت ١ : ٢ مع دريس البرسيم . ولابد من التنوية فى هذا الساق أن سعف النخيل وتبن القمح قد تم معالجتها مسبقا بالامونيا لتحسين قيمتها الغذائية . وقد دلت النتائج على أن معاملات الهضم الظاهري: للماده الجافة والماده العضوية ، والبروتين الخام واللياف الخام فى العلف المقارن (I) وسعف النخيل (II) وتبن القمح (III) والتمور المستعبده (IV) ونوى التمور (V) على النحو التالى : الماده الجافة : ٥٧,٥٧ ، ٤١,٠٠ ، ٤٤,١٩ ، ٨٧,٤٣ ، ٦٩,٥٣ . الماده العضوية : ٦٠,٥٠ ، ٤٥,٥٩ ، ٤٧,٨٠ ، ٨٩,٣٨ ، ٧١,٤٤ . البروتين الخام : ٧٠,٦٣ ، ٢٢,٠٣ ، ٢٥,٥٧ ، ٢٠,٧٥ ، ٣٦,٠٣ . الاليف الخام : ٤٦,١٢ ، ٤٣,٤٤ ، ٦٠,٩٠ ، ٣٨,٣٠ ، ٥٢,٤٨ .

أما عن المواد الكلية المهضومة والبروتين الخام المهضوم فقد تم حسابهما لجميع المواد العلفية المستخدمة (I الى V) على التوالى : المواد الكلية المهضومة : ٥٣,٥٢ ، ٤٠,٢٧ ، ٤٧,٨٠ ، ٨٧,٢٤ ، ٧٣,١٩ . البروتين الخام المهضوم : ٨,٨٢ ، ٨,٧٩ ، ١,٨ ، ٦,٥ ، ٢,٨٨ .

وقد دلت النتائج على أن التمور المستعبده ونواتها قد تفوقت فى صلاحيتها كعلف للمجترات على جميع المخلفات الأخرى قيد الدراسة بما فى ذلك البرسيم .

UTILIZATION OF DIETS WITH DIFFERENT LEVELS OF DISCARDED DATES BY GROWING AWASSI LAMBS

(59)

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ABSTRACT

The Kingdom of Saudi Arabia is now producing huge quantities of dates annually. Needless to mention that a certain proportion of this crop will be unsuitable for human consumption and so will be discarded. However, this low quality dates are finding an ever-increasing use in the feeding of sheep by the traditional owners of these animals. With the formentioned in mind the present study was conducted to determine the optimum level of dates that could be incorporated in the rations of sheep. Four rations containing different proportions of discarded dates viz. 0, 15, 25 and 35% (DM basis) and called rations 1, 2, 3 and 4, respectively were formulated to ensure that they would be both isocaloric and isonitrogenous. Each of these rations was fed to 10 Awassi male lambs for a period of 60 days to measure average daily live weight gain, feed dry matter intake as well as feed conversion. At the end of the feeding trial half of the animals in each treatment were employed to estimate the apparent digestibility of the rations. Collected data illustrated that the optimum level of dates that could be included in the rations of sheep was about 25% of the dry matter of the rations. At that level the dry matter of the ration was utilized even more effectively than barley grains containing ration. The apparent digestibility results were synonymous to the formentioned finding.

Key Words: Agricultural by-products, Discarded date, Ruminant feeds

INTRODUCTION

Like any other industry, dates production in Saudi Arabia leaves behind a sizeable amount of by-products in the form of discarded dates and date pits. The quantity of discarded dates was estimated by Williams (1978) to represent about 20% of all dates produced in

Saudi Arabia annually. If the later assumption is tenable it means that about 100000 tons of discarded dates are available yearly for animal consumption. it goes without saying that this large quantity of dates will not be utilized properly as a feed in the absence of some knowledge about their nutritive value and the limit of their rate of inclusion in the different ratios. Hence the present investigation was carried out to determine the optimum rate at which dates could be incorporated in the ration of sheep.

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