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THE NUTRITIVE VALUE OF FODDER BEET UNDER THE U.A.R. CONDITIONS.

By

A. Abou El-Hassan[1], S. El-Samman[1], A. Radwan[2] and G. Stino[2]

Fodder beet cultivated in newly reclaimed area in U.A.R. directed the attention to this study. Some seed pre-sowing using G.A. and C.C.C. treatments were performed to increase its yield by raising its stand percent. It was found that there was no significant differences among the tratments, which might be due to the hetroginity of the soil or to the lack of experience in this crop production.

The chemical composition and the digestibility trials were carried out on both dried tops aad dried roots to determine their feeding values. The ratio between tops and roots was 1 : 9. The yield was 2.283 tons of tops containing 18.13% D.M. and 20.0 tons of roots containing 14.99% D.M. considering the stand % of plant 46.3.

The roots contained a considerable amounts of C.P. from (16.18–18.56%) and N.F.E. ranging from (45.4–50.42%) on D.M. basis rospectively.

The feeding value of the fodder beet tops as fed was 45.52% S.V. and 57.22% T.D.N., and the feeding value of the roots as fed was 50.27% S.V. and 55.11% TDN. The roots contained a narrow nutritive ratio being 1 : 4 which could be recommended for feeding the lactating and growing animals.

This scope of study directs the attention to more investigations to be carried out on fodder beet tops and roots which might help in introducing such forage crop to be cultivated in the UAR and could help in solving the problem of feed shortage during the summer period.

In U.A.R. there is a shortage of green fodder for livestock during summer months. Therefore, any crop which might help in solving this problem, ought to be sought for investigation.

The relatively quicker rate of land reform in the U.A.R. and the establishment of the High Dam would provide new areas of land to be cultivated. In fact, fodder beet could play an important role for feeding livestock under these conditions. It can be cultivated in newly reclaimed areas and relatively poor soils.

Lot of questions at least in U.A.R. regarding this crop, are still to be answered. This might throw light on the utlization of fodder beet roots and tops (Foliage) as a recommended source of feed-stuff for feeding animals.

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1. Animal Nutrit. Section, Anim. Prod. Dept. Fac. Agric. Cairo Univ.
2. Plant Prod. Dept., Fac. Agric. Cairo Univ.

Regarding its nutritive analysis, digestion coeficients and feeding value for both roots and tops Ghoneim, 1967, reported the following data after (Kellner and Backer, 1962) :

Item	Dry matter DM	Crude protein GP	Ether extract E.E.	Crude fibre C.F	NFE	Ash	Feeding value Sv	Feeding value DCP
Analysis of roots%	80.00	8.30	5.00	6.9	52.00	7.00	54	5.4
Digestibilies %	—	65	68	68	95	—	—	—
Analysis of tops%	16.00	2.2	0.8	2.5	6.0	4.5	6.5	1.6
Digestibilities %	—	71	60	80	80	—	—	—

Therefore, the calculated feeding values for both roots and tops were 67.5% SV and 6.75 DCP and 40.6% SV and 10% DCP on moisture free basis respectively.

Evans, 1960 reported that the summative analysis of both roots and tops ware as follows :

Item	DM	CP	EE	CF	NFE	Ash
Analysis of roots %	22.20	1.00	0.1	1.10	18.80	1.20
Analysis of roots %	16.80	1.80	0.3	1.40	7.50	5.8

In this work, the following criteria was investigated : — Some Seed pre-sowing treatments were performed in an attempt to increase its yield by raising its stand percent. Additionally the relationship between these treatments and the chemical analysis of roots were presented. For completion, digestibility trials with sheep were carried out using either dried roots or dried tops to determine their feeding values. The yield from each roots and tops were estimated in tonnage. Moreover, the ratio between the yield of roots to that of tops was obtained.

Experimental and Methods

A variety of fooder beet was imported from D.D.R.[3] and planted in the Plant Research of the Faculity of Agriculture, Cairo University, on december the 5th 1966. The soil was silt lcam.

The experiment was contained of 9 treatments. Each treatment contained two rows of 25 plants each. The rows were 1 meter a part and the plants 50 cm. The treatment were arranged in the field in three replicates using complete randomize black design.

These treatments were :

1. Control checks (seeds were planteld dry).
2. Seeds were soaked in tap water for 24 hours before planting.
3. Seeds were stratified in humidified peat moss at 45° F for 30 days before planting.
4. Seeds were soaked for 24 hours in gibbrellic acid (G.A.) solution of 1000 ppm.
5. Seeds were soaked for 24 hours in gibbrellic acid solution of 500 ppm.
6. Seeds were soaked for 24 hours in gibbrellic acid solution of 250 ppm.
7. Seeds were soaked for 24 hours in C.C.C.[4] solution of 2500 ppm.
8. Seeds were soaked for 24 hours in C.C.C. solution of 1000 ppm.
9. Seeds were soaked for 24 hours C.C.C. solution of 500 ppm.

On march the 7th 1967 each plant received equal amounts of fertiliysation. The fertilisers consisted of 50 Kgs. of ammonium sulphate 100 Kgs. of Super Phosphate and 50 Kgs. of Potasium Sulphate per feddan.

Plants reached the proper stage of maturity on July the 30th 1967. They were picked and transfered to the Animal Production Department where nutritional and chemical studies were conducted. The yield was expressed as roots and tops weights.

Data were analysed statistically and the signeificant differences were recorded according to Senedecor, 1956.

Sampling roots for Chemical analysis :

A representative sample was taken from each replicate to form a composite sample for the treatment in question. The roots were cut into longitudinal sections which were grated and well mixed for sampling.

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3. Deutch Democratic Republic.
4. (2-Chloroethyl)-Trimethlyammonium Chloride.

For moisture determination 30 grams were taken. For preparing a dry sample of the roots to be kept for summative analysis, 200 grams of the fresh material were dried at 70°C. Tt was milled to a fine material which was kept in glass-stoppered jars.

Digestion trials :

Three digestion trials were performed to determine the feeding value of each dried roots and dried tops. Clover hay was applied as a basal ration using duplicate sheep.

Sampling the feed and the faeces :

The roots were harvested and immediately sliced· mixed and spread in a thin layer of ca. 20 cm. to be dried in open air. The roots were turned over every two days. After being dried, they were heaped in suitable place. The necessary amount for digestion trial was taken. The same procedure was followed with the tops, except the necessary amount for the digestion trial was chopped into ca. 2 inchs and thoroughly mixed. A representive sample from each of the feed and faeces was laken daily for drying to be user for chemical analysis.

Feeding :

When clover hay was used alone 1300 g. from it was consumed daily by each ram. The air dried roots and tops (400 g.) from each was consumed daily by each ram along with 500 g. air dried clover hay as a basal ration. Animals were fed twice daily and water was affered *ad lib.* Each of the preliminary period and the collection period lasted for 10 days.

Analytical methods :

The ordinary conventional method of the (A.O.A.C., 1955) were used for the chemical analyses of feed and faeces with slight modifications (Abou-Hussein, 1958).

For calculating the starch value, deduction of crude fibre was according to Kellner, 1926, being 0.29 and 0.58 kg. SV for each 1% crude fibre with the roots and tops respectively.

Results and Discussion

Effect of different treatments on stand percentage and the yield of the different parts of the plant :

Data indicated in Table I revealed that the highest stand percent was obtained by soaking pre-treatments, whereas, the lowest percentage was noticed by the G.A. solution at 500 ppm.

Regarding the weight of the whole plant, it is postulated that the G.A. at 500 ppm. produced the heaviest plants, while the lowest concenteration (250 ppm.) of this regulator produced least weight.

TABLE 1.—Effect of different treatments on the stand percentage and the yield of the different parts of the plant

Treatments (Tr.)	Stand Percentgge	Tops		Roots		Whole plant		Tops to Roots Ratio
		W/g	%	W/g	%	W/g	%	
1	42.31	478	8.1	5448	91.9	5926	100.0	1 : 11.4
2	58.33	697	11.7	5272	88.3	5969	100.0	1 : 7.7
3	42.95	633	10.1	5658	89.9	6291	100.0	1 : 8.9
4	45.51	610	10.2	5439	89.8	6049	100.0	1 : 8.9
5	25.69	575	7.5	7649	92.5	7624	100.0	1 : 12.3
6	48.90	536	11.1	4288	88.9	4824	100.0	1 : 8.0
7	47.11	611	9.8	5648	90.2	6259	100.0	1 : 9.3
8	44.80	642	10.4	5508	89.6	6150	100.0	1 : 8.6
9	42.30	566	8.9	5808	91.1	6374	100.0	1 : 10.3
Average	46.43	594	9.6	5569	90.4	6163	100.0	1 : 9.4

Moreover, it is evident that C.C.C. treatments at concentration of 1000 ppm. resulted in the heaviest tops whereas, the control checks had the lowest weight of tops.

Considering the top/root ratio, the G.A. at 500 ppm. produced the widest ratio being 1 : 12.3 while, the narrowest ratio acheived by the water soaking pre-treatment was 1 : 7.7.

Despite the noticeable variation between the different values of tops and roots, the analysis of variance indicated no significance.

The insignificance of the results might be referred to the hetroginity of the soil or to the lack of experience in this crop production.

It is worth to indicate that the average value of the different treatments were 46.43% for the stand percent, 594 g., 5569 g. for the tops and roots respectivety. The average ratio between tops and roots was 1 : 9.

The yield of tops and roots per feddan :

Considering that the plants were planted 50 cm. a part on rows 1 metre a part, the total plants per feddan was about 8000 plants. The yield in tons per feddan could be calculated as follows :

$$\frac{6163}{1000} \times 8000 \times \frac{463}{10 \times 100} \times \frac{1}{1000} = 22.83 \text{ tons.}$$

Since the ratio between tops and roots was 1 : 9, the yied of the tops according to the above estimation would be 2.283 tons containing an average of 18.13% dry matter (Table 2). For the roots, the yield would be 20.0 tons containing an average of 14.99% dry matter (Table I).

It is worthy mentioned in this connection that this plant did not flower under U.A.R. conditions, despite the different treatments used.

Therefore, further investigations are required for forcing this plant to flower and more information on cultivated practices and plant beheavior.

Effect of the different treatments on the moisture content of the fresh roots :

Results in Table 2 indicated that a slight difference in the moisture content was obtained among the different treatments in both roots and tops. The roots contained a higher percentage of dry matter (18.13%) and the tops contained 14.99%. This result agrees with those found in the literature (Evans, 1962 and Ghoneim, 1967).

Effect of the different treatments on the nutrients content of the dried roots :

As the roots are the main part of the plant to be used for feeding animals, a special attention was directed to its chemical composition. Results in (Table 3) showed that the roots in general had a considerable amounts of CP ranging from 16.18-18.56% on D.M. basis. The lower value was found in treatment 9, while the highest figure was obtained with treatment 2. (Table 3). In this connection Ghoneim, 1967, reported a lower figure being 10.4%. This difference might be due to the variety of the fodder or the kind of treatment. The higher CP content of this fodder would rank it as an additional source rich in protein for feeding animals. Concerning the other constituents, it was also observed that this fodder contained a higher percentage of N.F.E. and ash. Their ranges were successively (45.40-50.42%) in tr. 9 and, Tr. 5 and (17.59-21.61%) in Tr. 3 and Tr. 9. These results are not in accordance with those recorded by Ghoneim. 1967 and Evans, 1960.

TABLE 2.—EFFECT OF THE DIFFERENT TREATMENT ON THE MOISTURE CONTENT OF THE FRESH ROOTS

No. of treatment	Fresh tops		Fresh roots	
	Moisture %	Dry mattar %	Moisture %	Dry mattar %
1	81.80	18.20	85.50	14.50
2	82.10	17.90	85.30	14.62
3	81.66	18.34	86.22	13.78
4	82.07	17.93	84.60	15.40
5	81.95	18.05	86.09	13.91
6	82.66	17.34	83.85	16.15
7	81.35	18.65	84.16	15.84
8	82.40	17.60	85.35	14.65
9	81.81	19.19	83.94	16.06
Total . .	736.80	163.20	765.09	134.91
Average .	81.87	18.13	85.01	14.99

Regarding the C.F. content of the roots, it was found that their values were within the ranges recorded by the different authors in the literature on rice bran or wheat bran as a carbohydrated concentrates (Hàssàn, 1968).

The same findings were noticed with the E.E. content. Nevertheless, among the different treatments there was no pronounced effect on the chemical composition of the roots. This result is expected because the difference between treatment was based on botonical procedures not on nutritional methods.

TABLE 3.—EFFECT OF THE DIFFERENT TREATMENT ON THE NUTRIENTS CONTENT OF THE DRIED ROOTS

No. of Tr.	DM %	Chemical analysis on dry matter basis				
		CP %	EE %	CF %	NFE %	Ash %
1	90.72	16.28	1.07	13.28	50.23	19.14
2	87.27	18.56	1.01	12.14	48.08	20.21
3	90.38	17.36	1.41	14.31	50.33	17.59
4	88.34	16.22	1.47	13.10	48.03	21.18
5	86.02	16.79	1.52	11.29	50.42	20.08
6	86.08	17.53	1.14	12.11	49.59	19.63
7	92.83	18.04	0.96	14.15	45.70	21.15
8	89.42	17.45	1.14	13.41	49.15	18.85
9	90.15	16.18	1.11	15.69	45.51	21.61
Average .	89.02	17.51	1.12	13.27	48.55	20.05

Digestion coefficints and feeding value of dried tops and dried roots :

Regarding the digestion coefficients and feeding value (using sheep) with either the tops or the roots of the fodder beet the results are presented in table 4. Clover hay of the *Trifolium alexandrinum* was used as the basal ration in both cases. Composite samples from the tops of the different treatments and also the roots of the plant material were used to find out the feeding value of each component.

The digestion coefficients of the nutrients of the tops were 59.39, 98. 79, 89.74 and 75.45% for CP, EE, CF and NFE respectively. These results are comparable with those found in peanut hay especially with the digestion coefficints of CP and NFE which were 55.24 and 74.28% respectively (Abou-Raya *et al.* 1969). The results reported by Ghoneim, 1967 concerning both

nutrients are higher than those found in this work. They were 71 and 80% for the CP and the NFE respectively. The digestion coefficients of the EE (98.79%) and the CF (89.74%) in this work were higher than those reported by Ghoneim, 1967, which where 60 and 80% respectively.

TABLE 4.—THE ANALYSIS, DIGESTION COFFICIENTS AND FEEDING VALUE OF DRIED TOPS AND DRIED ROOTS

Item	DM	Analysis, degestion coefficients on DM basis					Feeding value as fed	
		CP	EE	CF	NFE	Ash	SV	TDN
Dry roots								
Analysis	91.50	17.71	1.00	14.71	45.65	21.93	50.27	55.11
Digestion Coeff. .		65.22	100.0	61.22	83.82			
Digestible nut. .		11.44	1.00	9.00	38.26			
Dry tops :								
Analysis	89.80	15.57	3.82	20.82	37.40	22.39	45.52	57.22
Digestion Coeff. .		59.39	98.79	89.74	75.45			
Digestible. nut. .		9.44	3.77	18.68	28.82			

The digestion coefficients of the nutrents in the roots were 65.22, 100. 00. 61.22 and 83.82% for CP EE, CF and NFE respectively. Regarding the digestion coefficients of CP and NFE the results in this work were within the ranges recorded by Hassan, 1968 for rice and wheat brans, while there was some differences with the other nutirents.

The digestible nutrients in the tops were 9.44, 3.77, 18.68 and 28.8% for CP, EE, CF and NFE repectively. The feeding value of the tops as fed was 45.52% SV and 57.22% TDN. To obtain the SV figures the crude fibre deduction was used after Kellner, 1926 being 0.58 and 0.29 Kgs. SV per 1 % CF in tops and roots respectively.

When comparing these results with those recorded with cover hay (by Ghoneim 1967), and the air dried sweet potatoe foliage (El Moghazy, 1965), it can be siad that the SV of the fodder beet tops had a higher feeding value than the both mentioned roughages. This conclusion could recommend the application of the fodder beet tops for feeding animals.

The roots had higher digestible values in CP and NFE than the tops being 11.44% and 38.26% while they contain lower EE and CF values than the tops being successively 1% and 9.00%. The feeding value of the roots as fed was 50.27% SV and 55.11% TDN.

The feeding value of fodder beed roots expressed as SV approaches those of the undecorticcated cotton seed cake and rice bran (Ghonein, 1967.) The same findings are quite simelar to those reported by Ghonein, 1967 with same findings are quite simelar to those reported by Ghonein 1976 with fodder beet roots. He advised applications as dried material than can be added to the rations of the lactating and fattening animals.

Moreover, the roots contain a narrow nutritive ratio being 1 : 4 which could be suitable for feeding the lactating and growing animals.

This scope of research directs the attention to more investigations to be carried out on fodder beet tops and roots and the requirements of the different animals from each ingredient.

The introduction of such feed-stuff to be cultivated in the UAR will help in solving problem of feed-stuff shortage in this country specially during the summer period.

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FIGURE 1.—Showing a complete plant which could reach a height of 80 cm.

القيمة الغذائية لبنجر العلف تحت ظروف الجمهورية العربية المتحدة

عبد الرؤوف أبو الحسن (١) — سعد السمان(١) — أحمد رضوان(٢)
جورج استينو(٢)

الملخص

أجريت هذه الدراسة على بنجر العلف الذى يمكن ادخال زراعته فى الأراضى المستصلحة بالجمهورية العربية المتحدة . وقد عوملت البذرة بمعاملات مختلفة باستخدام كل من GA, CCC بتركيزات مختلفة لزيادة المحصول وذلك برفع نسبة الانبات واتضح من الدراسة أنه لا يوجد فرق معنوى بين المعاملات المختلفة من حيث تأثيرها على نسبة الانبات ومحصول العرش والدرنات والتركيب الكيماوى لمحصول الدرنات وقد يرجع الاختلاف الطفيف الذى ظهر فى المعاملات المختلفة الى التربة أو نقص الخبرة بالنسبة لانتاج هذا المحصول الجديد .

وكانت نسبة العرش الى الدرنات ١ : ٩ وكمية المحصول الناتج ٢٨٣ر٢ طن من العرش به مادة جافة ٩٩ر١٤٪ و٢٠ طن من الدرنات بها ١٣ر١٨٪ مادة جافة باعتبار أن متوسط نسبة الانبات للبذور كانت ٣ر٤٦٪ وقد ظهر من التحليل الكيماوى للدرنات أنها تحتوى على نسبة عالية من البروتين الخام التى تتراوح بين ١٨ر١٦ و ٥٦ر١٨٪) والكربوايدرات الذائبة تتراوح بين ٤ر٤٥ : ٤٢ر٥٠٪ فى المادة الجافة تماما .

وبتقدير القيمة الغذائية لكل من العرش والدرنات أجريت تجارب هضم على كباش تامة النمو باستعمال الدريس كعليقة أساسية وجد أن القيمة الغذائية للعرش ٥٢ر٤٥٪ معادل نشا و ٢٢ر٥٧٪ مركبات مهضومة كلية وأن القيمة الغذائية للدرنات تساوى ٢٧ر٥٠٪ معادل نشا و ١١ر٥٥٪ مركبات مهضومة كلية وذلك فى المادة الجافة هوائيا كما وجد أن النسبة الغذائية للدرنات ١ : ٤ مما يكن معه استخدام هذا المحصول فى علائق الحيوانات النامية ومواشى اللبن .

وهذه الدراسة تسترعى الانتباه لاجراء مزيد من الدراسة على هذا المحصول فى المستقبل حيث يمكن استخدامه بنجاح كمحصول علف مما يساهم فى حل النقص الحاصل فى مواد العلف اللازمة لتغذية الحيوان .

(١) قسم الانتاج الحيوانى — فرع التغذية — كلية الزراعة — جامعة القاهرة .
(٢) قسم الانتاج النباتى — كلية الزراعة — جامعة القاهرة .