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A DISCUSSION OF SOME FACTORS LIMITING THE PRODUCTIVITY OF BERSEEM *CLOVER (TRIFOLIUM ALEXANDRINUM L.)*

MOHAMED S. RADWAN (1)

Some of the factors limiting the productivity of berseem clover in U.A.R. are discussed in light of the results of research on this crop.

The growth rate of berseem was estimated to be about 5.6 to 8.5 $g/m^2/$ day indicating low efficiency in dry matter production compared with other forages. This is ascribed to the slow development of leaf area before the first cutting and to deviation of the attained leaf area from an optimum leaf area index. This suggests careful studies of the factors affecting leaf area development especially sowing date and the seeding rate.

The narrow differences in productivity among local varieties offers no hope for increasing total forage production by selection among varieties. Also, success in developing improved strains seems dependent on the detection of variants within varieties or varietal crosses.

The quality of seed used for sowing plays a major role in limiting the total production of berseem forage. This is evidenced by the large variation among farmers seed lots of the fahl variety. The state is urged to apply seed certification measures to insure the distribution of good quality, seed.

Berseem clover is the principal forage legume in U.A.R. sown in an area of about 2.44 million faddans [5] of which 1.3 million is considered a catch crop yielding one or two cuts before sowing cotton. In the rest of the area, it is grown as a regular crop for soiling, silage and hay.

The total forage produced from berseem is estimated as 41 million tons ; the feeding value of which makes for more than 70 % of the total food units from available feeding stuffs. The sum of locally produced animal feeds can barely be sufficient for the existing livestock population, if rational use of berseem forage is excercised. However, the rising demand for animal products by the growing population calls for an increase in livestock and poultry production to offset the deficit in their products. This necessitates the search for methods of increasing the amount of feed stuffs especially berseem. The object of this report is to discuss some of the major factors limiting the productivity of berseem in U.A.R.

The efficiency of berseem in dry matter production.

If it is assumed that an average of 1.5 cuts are taken from the catch crop and 3.5 cuts from the regular berseem crop, an average forage yield of 7.1 tons per cut is obtained. For a regular crop of 4 cuts, the average yield is

(1) Agronomy Dept., Fac. of Agric., Cairo University.

then 28.4 tons per faddan or about 4.0 tons of dry matter for a growing season of more than 170 days. It means that the average growth rate for berseem plants is 5.6 g/m²/day. Record crops from the Miskawy variety go up to 6.0 tons per faddan yielding a growth rate of 7.5 g/m²/day. This shows that the daily growth rate of berseem is surprisingly low compared with other forage species (Table 1). According to theoretical calculations ([3]) a crop canopy is expected to have a daily growth rate of about 77 g/m². Although most plant species have mean daily growth rates which are 20-25 % of this potential ([3]), we see that berseem accumulates only about 10% of it.

The large inefficiency of berseem in dry matter production may be ascribed to;1) slow development of photosynthetic leaf area before the first cut especially in late sowings, and 2) the application of seeding rates which result in leaf area indices (leaf area per unit land surface) higher or lower than an optimum for maximum production. Data obtained by the author ([5]) show that increasing the seeding rate of the Fahl variety results in an increase in leaf area and forage yield up to a certain limit beyond which both leaf area and yield begin go drop (Table 2). Farid *et al.* ([2]) concluded that the rate of seeding used by farmers (26-32 kgs/F) is much greater than the 20 kgs rate they found optimum for highest yield from Miskawy berseem. Although these workers took no measurement on leaf area, their data imply that the rate of seeding affects forage yield through its effect on leaf area. However, the various factors affecting leaf area development in this crop need to be carefully studied.

Differences in Productivity among local varieties.

The identity of local varieties of berseem is rather vague. Except for Wafeer ([1]), the history of the other varieties, namely, Miskawy, Khadrawi, Saidi and Fahl is not exactly known. Fahl produces only one cutting since it is incapable of regrowth after cutting. The other varieties yield from 3 to 6 cuttings depending upon the date of sowing.

A study has been launched by the author ot asses the relative merits of these varieties as produceres of dry matter. The 5 varieties were sown in field plots at Giza in a latin square design. Dry matter production and leaf area at intervals were measured. The detailed results of this work will be published elsewhere. The data presented in Table 3 are, however, sufficient to indicate that the multicut varieties are essentially alike in their productivity. The Wafeer variety did not excell in forage yield as has been claimed by Raafat, Abou-Raya, and Sultan ([6]).

The high yield of the Fahl variety in comparison with the first cutting from multicut varieties appears to be the result of its peculiar growth type. Fahl plants were shown to accumulate more dry matter in their tops and less in their stubble and roots. Total dry matter production is similar for all varieties.

The quality of berseem seed.

The majority of farmers produce their own clover seed, the rest purchase uncertified seed from local dealers. A low premium is paid for good quality seed with the result that seed of poor quality is generally sown. The extent of weeds in clover fields attest to the poor seed quality.

The yielding ability of farmers seed lots appears to vary a great deal. This is evidenced by the results obtained for the Fahl variety (4). From various districts of the republic, 37 commercial seed lots of the Fahl variety were collected and compared with standard Fahl seed supplied by the forage crops section of the Ministry of Agriculture. A randomized block design was used and the trial was conducted at both Giza and Sakha. A summary of the results of both trials is given in Table 4. It is evident from these results that commercial lots differ widely in their productivity and general characteristics especially in relation to the ability to regrow after cutting. The outstanding fact is that most lots yield less than or equal to the standard Fahl seed. This indicates that the use of poor quality seed plays a major role in reducing total production. It is also worth noting that some lots gave exceptionally better yields than the standard variety. These lots could serve as breeding material for varietal improvement.

TABLE 1.—DRY MATTER YIELD AND DAILY GROWTH RATES FOR SOME FORAGE CROPS

Crop	Area	Yield T/A	Season days	Growth rate	Ref.
Sweet Sorghum	U.A.R.	10.0	120	19.9	—
Sudan grass	Calif.	13.3	160	18	3
Alfalfa	Calif.	14.5	250	13	3
Berseem clover	U.A.R.	4.0	170	6.6	—
Miskawy		6.0*	190	7.5	6
Fahl		4.14*	130	7.5	6

* Record yield,

TABLE 2.—THE EFFECT OF SEEDING RATE ON LEAF AREA INDEX (LAI) AT HARVEST AND FORAGE YIELD OF FAHL BERSEEM*.

	Seeding rate, seeds/m²			
LAI	2.25	3.11	4.03	4.01
Green Yield (Tons/F)	6.63	9.15	11.50	11.73

* Averaged for seeds of different size.

TABLE 3.—AVERAGE PERFORMANCE OF LOCAL VARIETIES OF BERSEEM

Character	Cut	Fahl	Miskawy	Khadrawy	Saidi	Wafeer
Forage yield (T./F) . .	1	11.5	8.2	9.4	7.4	7.2
	2	—	8.4	9.5	9.6	9.6
	3	—	4.9	6.0	5.6	4.9
Leafiness (%)* . . .	1	25.4	31.0	30.2	31.6	32.5
	3	—	17.0	19.1	15.1	21.5
Stubble (g./m²)* . . .	1	25.6	84.8	76.4	84.4	91.2
Roots (g./m)* . . .	1	24.4	30.0	27.2	31.2	32.4

* Dry weight basis.

TABLE 4.—RANGE OF PERFORMANCE OF 37 COMMERCIAL SEED LOTS OF FAHL BERSEEM GROWN AT 2 LOCATIONS COMPORED WITH STANDARD FAHL SEED

Character	Giza		Sakha	
	Commercial Lots	Standard Mean	Commercial Lots	Standard Mean
Forage yield (Tons./F)	7.2–13.5	11.4	8.1–19.9	9.1
Dry patter(%)	9.8–13.8	9.8	8.6–12.9	10.7
Regrowth rate*	1–4	2	1–5	2
Leafine (%)	26.1–43.4	28.2	15.0–26.8	16.7
Heading date*	2–36	6	16–39	23

* A scale of 1 to 5 ; 1 for no regrowth and 5 for abundant regrowth after cutting.

* Days after March 1.

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مناقشة بعض العوامل المحددة لانتاجية البرسيم المصرى

الملخص

نوقشت بعض العوامل المحددة لانتاجية البرسيم المصرى فى الجمهورية العربية المتحدة فى ضوء نتائج البحوث التى أجريت على هـذا المحصول . فقد قدرت سرعة النمو للبرسيم بحوالى ٦ر٥ الى ٨ر٥ جم / م٢ / يوم ، مما يدل على انخفاض القدرة على انتاج المـادة الجافة بالمقارنة بمحاصـيل العلف الأخرى . وتعزى سرعة النمو المنخفضـة الى بطء تكون الأوراق فى الفترة التى تسبق الحشة الأولى والى انحراف مساحة الأوراق الناتجة عن مساحة مثالية .

ويتطلب هذا دراسات دقيقـة للعوامل المؤثرة فى مسـاحة الأوراق خصوصا ميعاد الزراعة . ومعدل التقاوى .

وبخصوص انتاجية الأصناف الحالية فان قلة الفروق الوراثية بين الأصناف الحالية لا تقدم أى أمل فى زيادة المحصـول نتيجة للاختبـار بين الأصناف .

أما جودة التقاوى المستخدمة فى الزراعة فانها تلعب دورا هاما فى تحديد الانتاج الكلى للبرسيم .

والدليل على ذلك هو التباين الكبير بين تقاوى الزراع من صنف الفحل من الناحية الانتاجية ويستدعى هذا من الدولة سرعة تطبيق نظام اعتماد التقاوى لتوفير التقاوى الجيدة لزراع البرسيم .