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1975 - 1976

ANNUAL REPORT CIMMYT-I.D.G.C.

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I. INTRODUCTION

The 1975-76 crop season was marked as the best cereal production year in Algeria since 1909 (the date from which data is kept). The rain distribution in almost all the regions was excellent from seeding to mid dough stage, except parts of western Algeria, where drought during March, April and an early sirocco did considerable damage to the cereals. From then on there were unusually heavy rains in almost all regions causing considerable damage to the cereals. Barley was the worst affected. Official estimates are that the production during the 1975-76 season was 29 million quintals or close to 10 million quintals more than the national average.

The prolonged mild winter season helped the development of stripe rust into epidemic proportion in the eastern regions of Algeria. The spectrum of virulence was highly limited. However, the predominant variety Siete Cerros was susceptible. Based on the yield trial results of the past four years it is estimated that the average loss of Siete Cerros due to stripe rust was about 18% in the eastern regions of Algeria (TABLE A.1.).

Stem rust was also present in almost all regions. However, the prolonged cooler conditions did not permit it to develop into epidemic proportions. The virulence pattern based on the observations of the regional disease trap nursery suggests that, of the single genes only Sr.11 was effective. Almost all the combinations of Sr factors

EFFECT OF STRIPE RUST ON THE YIELD OF SIETE CERROS

3 Year Averages (1972-1975) compared to 1975-76 (Stripe rust year in the Eastern Region) season

TABLE A.1.

Stations ⟶	Algiers Central Littoral	Sidi-B-Abbes West Sub-littoral	Setif East High plateau	Khroub[1]) East Sub-littoral	Guelma East Littoral
3 year average Siete Cerros	59.15	34.00	20.25	26.88	34.01
3 year average Strampelli	59.95	35.17	21.12	24.30	36.79
Siete Cerros as percentage of Strampelli	99	97	96	111	92
1975-76 Siete Cerros	52.43	40.29	26.79	44.89	49.27
1975-76 Strampelli	52.14	39.26	34.02	53.39	60.83
Siete Cerros as percentage of Strampelli	101	103	79	84	81
% Gain or loss of Siete Cerros during 1975-76 season over the 3 year average	+ 2	+ 6	- 17	- 27	- 11
			18%		

[1]) Only two year average

also held the resistance. Most of the bread wheats in cultivation except Mahon Demias held resistance to the prevailing races. However almost all the commercial durums were susceptible. Derivatives of Langdon, Leeds and Wells like Mexicali and Flamingo were holding resistance to the prevailing races.
An analysis of the race spectrum during the 1974-75 season shows that races 15B, 9, 24, 19 and 17 were present.
Since race 11 and its subraces are reported in all the neighbouring countries this race is also likely in Algeria.

There was very little leaf rust during the 1975-76 season. Of the different LR lines only Th^6 x Aniversario, Thew and Fn x Mida/K117A showed a susceptible reaction showing that the virulence during the year was highly limited.

Septoria was of minor importance although humidity was present in abundance throughout the crop season. Lack of prolonged cloudy days and relatively warm winter season can be the factors which kept Septoria from developing into a major disease.

II. CEREAL BREEDING

A. BREAD WHEAT

Siete Cerros continued to be the predominant bread wheat variety in all the cereal regions. Stripe rust caused considerable damage to this variety in almost all the production fields in the eastern region of Algeria. Strampelli and Anza are under rapid multiplication.

Promising varieties and lines under its final stages of testings are reported in TABLE A.2. (Rfn^{2}-908/Fn x Gz139-GB1360-3228)C11fn^{3} A.6842-6P-1P-1P-3P of Chilian origin and Arz of Lebanon were the best.

Best selections from the first year trials are reported in TABLE A.3. Arz and Anza were again the top yielders in the 12th International Spring Wheat Yield Nursery grown at Guelma (TABLE A.4.).

The program continued to screen a wide variety of germplasm and segregating material of diverse origin at different agroclimatic conditions. The season provided good selection against stripe rust but drought stress was totally absent.

TABLE A.2.

PROMSING LINES AND VARIETIES IN THE 1975-76 BREAD WHEAT ADVANCED YIELD TRIALS

V.N°	Cross and Pedigree	Yield Qx/ha	% Strampelli	Average rank/ Rank Strampell
	Siete Cerros [1])	34.25	104	5.4
	Strampelli [1])	34.30	100	7.2
	Anza [1])	35.26	105	5.7
AA403	EMU"S" CM-8327-C-9M-1Y-0M	33.66	101	5.5 / 7.3
AA412	Inia-Soty x Czho 3-6G-1Y-3M-3Y-0M	34.71	104	4.5 / 7.3
BA431	(Cno-7C)^{2}CC-Tob CM-1679-1M-1Y-2M-3Y-501M-0Y	30.68	101	8.8 / 8.0
CA463	(Rfn^2-908/Fn x Gz139-GB1360-3228) C1lfn^3 A-6842-6P-1P-1P-3P	36.66	113	1.8 / 5.0
DA491	Arz	35.82	106	4.8 / 5.8
DA500	Jupateco 73	36.27	111	3.5 / 5.8
EA519	Mexicano 1481	37.41	109	3.3 / 7.0
AB741	HD832-Nor/Cno"S"-Cal x Nad CM-5618-G-7Y-0M-0Mch-0BK	39.30	95	5.8 / 3.8
BB773	Cno"S"-No66 x HD832/Cno"S"-Chris x On CM-2293-1MB-2BK-0BK	39.72	91	9.2 / 4.6
CB778	Bb"S" x CC-Inia 30521-20M-2Mch-2Mch-0Mch-0BK	40.80	106	3.7 / 7.2

[1]) Average of all 2nd year trials all stations.

TABLE A.3.

TOP 10 VARIETIES FROM THE FIRST YEAR YIELD TRIALS

ALGERIA 1975-76

V.N°	Cross and Pedigree	Average yield Qx/ha in comparison to Strampelli	% Strampelli	Average rank and Rank Strampelli
A-8	Gavilan	36.86 35.15	106	1 2.5
B.28	WS1877-Sx CM-15255-9Bj-0AL	35.38 28.03	132	3 13.5
B.36	Bobito"S" 38837-9Y-2M-1Y-3M-0Y-0AL	34.43 28.03	129	4 13.5
C.69	Anza-Tzpp CM-6438-2Bj-1Bj	34.14 31.34	114	3.7 9.7
D.83	7C-Pato(B) CM-790-8MB-6Bj-6Bj	40.11 36.82	109	1.5 4.5
F-141	Inia-Cal x Inia-CC 28467-67Y-1M-1Y-0M	28.86 29.03	106	5.5 9.0
F-150	RN-Mex1481 CM-7669-5L-0L	28.17 29.03	107	6.0 9.0
G-171	Tzpp-Son64 x Np/Cno"S"-Inia"S" 34002-2Mch-4MK-0Mch-0BK	50.02 47.58	106	3.0 5.5
J.226	Hork"S" CM-8874-K-1M-1Y-0M-0AL	53.25 51.40	104	3.0 5.0
J.237	Cal-Cno x Yr70 Alg-65-1BK-52AL	53.50 51.40	104	2.0 5.0
Strampelli Siete Cerros	Average over all the First Year Trials	39.09 39.94	--- ---	6.7 5.3

% Calculated as average over two or three locations.

TABLE A.4.

TOP 10 VARIETIES OF THE 12th ISWYN GUELMA-ALGERIA

V.N°	Cross and Pedigree	Yield Qx/ha	% Anza
964	Arz	70.86	101
963	Anza	70.19	100
989	$Y50_E$-Kal^3 35188-5M-(F1)-31Y-0M-8M-0Y	70.10	100
959	Ciano"S"	69.14	99
958	Torim.73	68.48	98
998	Tzpp-Pl x 7C CM.5287-J-1Y-2M-1Y-4M-0Y	68.10	97
996	Brochis"S" CM.5872-C-1Y-1M-3Y-0M	67.24	96
997	Tzpp-Pl x 7C CM.5287-J-1Y-2M-2Y-3M-0Y	66.48	95
999	Emu"S" CM-8327-C-9M-4Y-3M-0Y	66.38	95
957	Tanori-Resl.	66.10	94

CV = 11.14 CD at 5% 10.39

B. DURUM WHEAT

The cereal improvement program in Algeria is mainly concerned with the development of better adapted high yielding and better quality durums because the durums occupy close to 45% of the cereal area.

All the local varieties are of low yield potential and are also susceptible to most of the important wheat diseases. But almost all of them have good quality.

The cereal areas of Algeria are normally divided into three zones viz: littoral (plain), sub-littoral (hilly) and high plateau. However, from a crop improvement standpoint the latter two can be grouped together and constitute about 85-90% of the cereal lands.

Normally the agroclimatic conditions of the littoral zone are good. So also are the conditions for disease development. Thus varieties for this region must have in addition to high yield potential adequate resistance to the rusts, Septoria and mildew. In contrast, the sub-littoral and high plateau the agroclimatic conditions are highly variable. The winter season in these areas is much more severe with occasional snow during the early growth stages. The crop duration is little over eight months with late frost and early hot winds. These conditions demand varieties of semi-winter habit (or spring varieties with fair cold tolerance) and high yield stability.

Jori C. 69 was introduced in Algeria during the early stages of this program. Unfortunately its lack of adaptation for higher elevations

and lack of adequate disease resistance for the littoral zone made it unsuitable. INRAT 69 of Tunisian origin is a good variety for the lower elevations. When the winter is too cold, this variety shows a tendency to give high sterility and thus very low yield.
Capeiti of Italian origin is a fair yielder in most of the regions.
Cocorit 71 gives high stable yield, but its high yellow berry content makes it unacceptable. Mexicali seems to have good promise for the littoral zones.

Yield evaluations with many introductions during the past few years indicate that the cross T.dic Ver x Gll"S" can be a potential variety for the high plateau. Results of the most promising varieties from the advanced yield tests are reported in TABLE A. 5.
Crosses Cr"S"-F3Tu x AA"S"/Flg and Cr"S"-Gs"S" are the most promising and have done well in all the zones. The others, although superior in yield to the locals, are adapted only to the littoral zones.

Promising varieties from the second year trials, first year yield trials, IDYN and EDYT are reported in TABLES A. 6., A.7., A.8., A.9. Selections from the cross Rabi"S"-Flg"S" were outstanding with respect to yield and disease resistance. Two other groups which are also of interest were lines of Chilian origin OA547, PA554, PA564, PA556 (TABLE A. 6.) and lines of Turkish origin Q371 and R388 (TABLE A.7.). These two groups are likely to have some winter tolerance. Of this, the lines of Chilian origin were more later than desired and may pose a problem with the siroccos (early hot winds out of the Sahara).

TABLE A. 5.

MOST PROMISING DURUMS AT THE FINAL YIELD EVALUATION STAGES IN ALGERIA 1975-76

V.N°	Cross and Pedigree	Yield ¹) Qx/ha	% ¹¹) Local Check	Average ¹¹) rank
OB854	Cr"S"-F3Tu x AA"S"/Flg"S" CM-10200-1BK	36.43	124	3.2
OB861	Mexicali-75	30.74	103	12.0
OB863	Gta"S"-Pg"S" CM-10142-39M-0Y	32.21	108	7.4
OB864	BY_E-Tc^5 x Gs"S" CM-55-50M-2Y-6M-0Y	31.77	105	10.6
OB865	Capeiti highest check in trial OB	32.95	116	8.4
PB879	D durum S15-Cr"S"	35.31	130	7.8
PB884	Cr"S"-Gs"S"	34.38	127	4.8
PB885	INRAT 69 highest check in trial PB	29.69	111	9.6

¹) Average of 5 stations

¹¹) Averagesof 5 stations

TABLE A. 6.

PROMISING DURUM VARIETIES OF THE 2nd YEAR ALGERIAN YIELD TRIALS 1975-76

V.N°	Cross and Pedigree	Yield *) Qx/ha	% **) Local Check	Average **) rank
OA528	Rabi"S"-Flg"S" CM-10162-76M-4Y-0M	50.39	133	5.7
OA532	Cr"S"-Gs"S" x Parana CM-13053-6Y-1M-0Y	49.50	131	7.7
OA534	Cit"S" x Pg"S"-AA"S"/Ruff x T.dic. Ver-Gll"S" CM-14528-C-1Y-1M-0Y	50.69	133	4.7
OA536	Rabi"S"-Flg"S" CM-10162-76M-3M-0Y	50.30	132	6.3
OA547	Bidi 17^2 x Cfn-Landwarf/Lan T.3847-18T-2V-1P	49.81	131	5.7
OA535	Cocorit 71	45.88	121	14.7
PA551	Rabi"S"/LD393 x $Bell_E$-Tc^2 CM-10171-2BK-1BK	46.89	141	4.7
PA554	(CP x Landwarf-Lan)6201 Maliani Carozzi A.10326-1P-2P-2P	45.09	136	6.3
PA564	Alifen x Landwarf-Lan A.8405-3P-2P-2P	47.37	144	4.3
PA572	BY_E^2-TAC x Tc^2/Gll"S" 27570-2M-4D-1D-1D-0H	46.97	141	6.7
PA556	$(CP \times Landwarf\text{-}Lan)^2/BY_E$-$Tc^2$ A.10345-16P-6P-1P	44.40	133	8.3
PA565	Cocorit 71	43.69	131	12.0
QA583	Dwarf D S15-Cr"S" 33312-0Y-2M-0Y	44.62	127	4.0
QA586	Cr"S"-Plc"S" 31724-33M-6Y-0M	45.16	130	7.0
QA580	Cocorit 71	36.59	105	19.0

Continuation on next page

Continuation TABLE A. 6.

V.N°	Cross and Pedigree	Yield [1]) Qx/ha	%[2]) Local Check	Average [2]) rank
RA604	Gta"S" x 21564-AA"S"	40.96	126	3.5
RA607	Parana 66/270	40.38	124	4.5
RA623	Masa 8Y-0M-0BK	42.28	130	3.0
RA624	Gerardo 525	40.79	126	5.0
RA620	Cocorit 71	35.40	110	16.0

[1]) Average of 3 stations

[2]) Averages of 3 stations

TABLE A.7.

PROMISING LINES IN THE FIRST YEAR DURUM TRIALS

ALGERIA 1975-76

V.N°	Cross and Pedigree	Yield Qx/ha	% Local Check	Average rank
O-306	Rabi"S"-Flg"S" CM-10162-76M-4Y-0M	46.36	148	3.0
O-307	Cit 71-Gta CM-18565-10Y	44.76	140	5.0
O-309	Plc"S"-Ruff x Gta-DG715 CM-17904-B-3M-1Y	46.88	148	3.3
O-313	USA III C-Gs"S" {(Gll"S"/BY$_E^2$-Tc x ZBW)Flg} CM-14403-G-3Y-GM-1Y	43.96	138	7.0
O-312	Jo"S"-Cr"S"(T.dur T.sph-Gll"S" x M.Sad/AA"S") CM-12969-2Y-1M-1Y	43.15	137	7.0
P-326	Ho"S"-AA"S" x Plc"S" CM-3337-1Y-3M-0Y	42.93	145	2.3
P-329	Pg"S"-31810 CM-10071-2M-0Y	41.01	138	6.7
P-343	Booby"S"	42.60	148	3.7
P-350	Cr"S"-AA"S"	43.67	146	4.3
Q-371	Uveyik 126-61-130 C.23-9-0A	40.67	119	7.7
Q-373	B.144	41.03	121	5.7
R-388	Uveyik-61-30 1A-69A-0A	40.36	121	5.7

TABLE A.8.

TOP 5 VARIETIES OF THE IDYN - KHROUB - ALGERIA

V.N°	Cross and Pedigree	Yield Qx/ha	% Mexicali
1040	Rabi"S"-Flg"S" CM-10162-76M-0Y	57.24	101
1046	Gta"S" x 21563-AA CM-10143-6M-3Y-1M-2Y	56.57	100
1035	Mexicali	56.48	100
1027	Quilafen	56.48	100
1037	S15-Cr"S" 33312-7Y-2M-1Y-0M	55-62	99

CV = 9.94 CD at 5% = 8.22

TABLE A.9.

TOP 5 VARIETIES OF THE EDYT - KHROUB - ALGERIA

V.N°	Cross and Pedigree	Yield Qx/ha	% Mexicali
1019	21563-AA x Flg"S" CM-9799-126M-1M-4Y-0M	60.00	108
1015	Plc-Ruff x Gta-D6715 CM-17904-D-3M-1Y-0Y	58.36	105
1006	Cr"S"-Gs"S" x Pg"S" CM.13434-5Y-1M-4Y-0M	57.00	102
1004	Jo"S"-Cr"S"{(T.dur. T.sph/Gll x M.Sad)AA} CM-12969-2Y-1M-1Y-0M	56.86	102
1005	Chap-21563 x Cr"S" CM-12857-10Y-2M-1Y-0Y	56.00	100

CV = 9.61 CD at 5% = 7.09

Good resistance to stem rust and Septoria are essential for a stable yield in the littoral zones of Algeria. The experimental station in Algiers during 1975-76 had a good infection of stem rust. Of the 282 durum entries in the 8th IDSN revealed 66 resistant entries. Unfortunately 54 of them are from crosses involving 61-130 Lds, Leeds, Langdon, Wells, Lakota or Rolette and in 10 others one of these parents are indirectly involved. Thus 64 out of 66 have almost the same background for the stem rust resistance. The remaining two, IDSN 6has D117 in the parentage and this is M'Rari 549 of North African origin and is reported to have good stem rust resistance in this region. The other IDSN 184 has Ag. elongatum as the source of resistance. This situation indicates a lack of adequate width for the stem rust resistance in the Mexican germplasm. Taking this into account, many crosses during the past season were made to widen the stem rust resistance base using varieties of diverse origin like Beladi 116, Tremes Molle, CI 8155, Kasuska, Tai and D16, etc.

Septoria is the second most important disease for the littoral zone. Crosses were made with BD1645 of Tunisia, Jaafri, Lobeiro and Amarelejo of Portugese origin in order to introduce Septoria tolerance.

A second group of crosses made were lines with high stable yield to lines with high quality. It is hoped to combine during the coming crossing season the F1's made for disease resistance with the F1's made for quality in order to combine yield stability and quality all in one background.

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For the high plateau we hope to combine crosses with varieties of Chilian and Turkish origin to the Mexican with Mexican with local high quality durums in double crosses to introduce yield spring habit and cold tolerance.

The program of durum improvement is under rapid expansion. Close to 350 crosses were made during the 1975-76 season. About 650 single plants were selected during this season out of Top and Double Cross F1's to be grown as F2 individual lines during the coming season. Results of these expanded efforts will be visible in the yield trials from 1980-81 season onwards.

C. ON FARM ADVANCED VARIETY DEMONSTRATION TRIALS

The advanced variety demonstration trials are conducted with regular field equipment on representative farms in each of the three general production areas. The trials are planted in the three general production zones: coastal (littoral), medium altitude (sub-littoral 200-600 meters) and high elevation (high plateau above 600 meters). They are made up of the best selections from the third year yield trials with check varieties of high yield and one or more of the best traditional varieties. These are replicated trials with plot size of about 30 by 2.5 meters seeded in well prepared seed bed and fertilized at the recommended rates of phosphorous and nitrogen for the region. Herbicides are applied with field sprayers when needed.

The Constantine region was heavily attacked by stripe rust in 1976. Yield of Siete Cerros was reduced about 25%, test weight and quality

was reduced by both the late rain and rust. Mexicano 1481, Marco Juarez and Bb x Ciano were also severely infested with stripe rust. Some stripe and stem rust occurred in the Algiers station, however very little damage. Siete Cerros was one of the top yielders in the Algiers and Oran regions.

Rainfall in the Oran region was below normal. A prolonged dry period from December through March reduced tillering and forced heading. Late rains helped to mature the wheat. Stands were reduced also by poor seeding due to a drill malfunction. Brome grass infestation at Sfisef also reduced yield and favored the taller more competitive varieties. In TABLE A.10. and A.11. are presented the yield data for the advanced yield trials.

In the Constantine region, Anza was the outstanding variety. It was resistant to stripe rust last year. It has good resistance to Septoria and a high yield potential in the littoral and sub-littoral regions. Anza is too early for the high plateau and also too short. It does not compete very well with grassy weeds or heavy infestation of broad leaf weeds. The variety is under increase and should be recommended for the higher rainfall sub-littoral and littoral regions.
Syrimex and Chanate # 2 also are doing well. These varieties have resistance to stripe and stem rust and are better adapted to the sub-littoral and high plateau regions. With a straw height similar to Siete Cerros they are better adapted for competition to serious weed infestation than Anza. All three varieties have better test weight than Siete Cerros.

TABLE A, 10 YIELD IN QX/HA FOR 22 BREAD WHEAT SELECTION AND VARIETIES IN FIELD PLOT TRIALS IN ALGERIA, 1975-76

Varieties	N° Trials	Yield Qx/ha +				% Siete Cerros
		Constantine	Algiers	Oran	Ave.	
Anza	10	45.96	35.95	20.05	36.77	114
(Son64 x Tzpp-Nai/Napo)(LR64 x Tzpp-AN^2)	8	41.07	37.02	----	39.04	113
Syrimex	10	40.49	39.01	22.10	36.22	112
$Y50_E$ x Kal^3	10	39.99	37.87	18.55	34.86	108
Cno-Pj62 x Cno-7C	10	39.66	36.76	21.35	34.84	108
(21931/Ch53-An x Gb)An64	10	41.20	36.05	16.25	34.17	106
Chanate # 2	10	39.76	35.01	21.20	34.14	106
Nor x Inia"S"-Napo63	10	38.50	36.62	18.80	33.82	105
Kal x Bb	10	38.32	33.68	22.35	33.27	103
Nuri 70	8	40.57 °)	35.37	16.85	32.05	102
Bb"S"	10	35.99	35.80	14.60	32.63	101
Napo63 x Tzpp-Son64/8156	10	38.73	32.39	19.70	32.49	100
Siete Cerros	10	31.56	37.70	23.30	32.36	100
Son64A-SKE/An x St	10	39.09	33.86	15.10	32.25	100
Mexicano 1481	10	33.92	36.51	19.25	32.05	99
Marco Juarez	10	34.59	34.49	21.25	31.82	99
Napo63 x Tzpp-Son64/8156	10	38.55	36.92	14.95	31.69	98
Cal/Cno x LR64^2-Son64	10	33.63	35.62	19.80	31.66	98
Cno"S" x Sk-Cfn	8	31.04 °°)	33.16 °°)	19.80	29.02	96
Bb x Cno	10	32.19	35.13	19.00	30.73	95
Florence Aurore	4	-----	32.15	-----	32.15	85
Mahon Demias	6	20.20	-----	25.50	21.65	75

\+ Average for the trials in each region - 4 in Constantine, 4 in Algiers and 2 in Oran

°) Two trials in Constantine region

°°) Three trials in Constantine and Algiers region

Several durum varieties were equal or slightly higher yielding than Cocorit 71. Anhinga II has been a excellent yielding variety in previous trials. It is taller than Cocorit, somewhat weaker in straw strength, but has good kernel characteristics and a more suitable maturity date. Cocorit tends to be too early and short and in addition produces a high percentage of yellow berry. Capeiti was only grown in Algiers region and was exceptional last year, as compared to previous years performance.

TABLE A.11. YIELD IN QX/HA FOR 20 DURUM WHEAT SELECTIONS AND VARIETIES IN FIELD PLOT TRIALS IN ALGERIA, 1975-76

Varieties	N° Trials	Qx/ha				%
		Constantine	Algiers	Oran	Ave.	Cocorit
Appulo Capeiti x Grifoni	8	34.80	32.19	20.55	30.26	104
Masa 54-OM-OBK	8	36.29	29.88	21.10	30.09	104
Gerardo 598	8	34.32	29.01	23.50	29.03	102
Anhinga II	8	33.92	29.89°	21.80	29.38	101
FD 1303	7	35.14	29.10)	21.00	29.36	101
Cocorit	8	36.13	27.97	20.05	29.05	100
Giorgio 447	8	35.01°°	27.91	20.60	28.74	99
21563 x AA"S"	7	41.00)	29.27	18.75	29.61	99
Gerardo 657	8	32.30	29.74	20.15	28.30	97
T.Dic Ver x Gll"S"	8	35.68	25.47	19.85	27.89	96
Giorgio 653	8	34.38	26.74	17.00	27.17	94
Gerardo 572	8	30.03	27.77	20.70	26.85	92
Giorgio 532	7	27.40 °°)	30.50	16.60	25.64	92
Giorgio 449	8	30.97	27.08	19.05	26.53	91
Oued Zenati	8	27.57	22.54	22.65	24.01	79
INRAT 69	5	-----	29.85	24.20	27.59	111
Capeiti	3	-----	35.08	-----	35.08	127
Anhinga I	5	-----	30.43	20.20	26.34	106
Maghrebi	5	36.43	-----	22.45	30.84	104
Flamingo"S"	3	42.92 +)	-----	22.75	29.47	99

°) 2 Locations in Algiers region

°°) 2 Locations in Constantine region

+) 1 Location in Constantine region

III. PRODUCTION RESEARCH

A. WEED CONTROL STUDIES

1. Introduction

As reported in the introduction, climatic conditions were excellent for wheat production in 1975-76. TABLE P.1. illustrates the conditions in Eastern Algeria. Of particular interest is the number of days of rainfall each month. Early September rain sprouted weeds and volunteer cereals. October was sunny and dry allowing good land preparation and good conditions for seeding barley and forage crops. However, November had very few days when the soil was dry enough for seeding and December also had few days for seeding. The first part of January was also wet, and much of the seeding was later than optimum. March, April, May and June had rain on 45 days out of 122 making weed control difficult and favoring the development of stripe rust.

Weeds are the most serious cause of yield losses in Algeria. Weed competition decreases the fertilizer response and reduces the effectiveness of the additional inputs resulting in low productivity. Weed growth is increased by fertilizer application which causes more competition for both moisture and soil nutrient for the crop. A large percentage of the fertilizer inputs are wasted on weed growth.

There are two major weed problems in Algeria. One problem concerns the weed competition of dicotyledonous weeds, the other by monocotyledonous weeds. Since cereals are monocotyledons, this type is the most serious competitor and the most difficult to control both by cultivation and by herbicides. Losses from this type of weed are much more severe.

TABLE P.1. RAINFALL BY MONTHS WITH FREQUENCY FOR EL-KHROUB STATION IN MM FOR CROP YEAR 1975-76, EL-KHROUB, ALGERIA

	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	TOTAL
Amount	42.0	11.1	74.1	31.4	23.1	43.6	93.2	74.0	88.1	70.0	550.6
Frequency (days)	5	2	13	9	6	7	14	11	11	9	87

Both types are often present in the same field and this increased both the losses and the control problems.

2. Effect of proper seed bed on weed control

One of the most effective weed control measures is the preparation of a weed free seed bed that allows the cereal crop to emerge in advance of weeds. Eliminating one more crop of germinating weeds before seeding and getting an even vigorous emergence of the cereal crop by uniform seeding makes the wheat more competitive to later emerging weeds. This can reduce the yield loss and may be more effective than a herbicide application. This is illustrated in TABLE P.2. where the results of two seeders are compared. One resulted in a weed free seed bed, and the other seeded into a seed bed that was not free of germinating weeds. In Algeria it is often necessary to seed into a dry seed bed. Many fields are so heavily infested with weeds that preseeding cultivation is not sufficient control. The problem must be approached by control both from cultivation and herbicides.

3. Herbicides and their role in weed control

Herbicide trials were conducted in the Algiers and Constantine regions. All but one trial was applied with regular field sprayers with plot size 10 meters wide and 30 to 50 meters long. All herbicides were applied at dosages recommended by the label and at the proper stage of growth. Trials were replicated and used both as demonstration and for research. The experiments were conducted on production fields of wheat on farms throughout the regions.

TABLE P.2. EFFECT OF AN ADDITIONAL CULTIVATION ON WILD OATS. A COMPARISON OF YIELD OF INRAT 69 SEEDED WITH TWO DIFFERENT DRILLS

Factors	Nordsten	Shearer
Wild oats Heads/m^2	152	33
Wild oats Seeds/spike	54	32
Wild oats Seeds/m^2	8208	1056
Wild oats Seed production Qx/ha °)	20.52	2.64
Wheat yield	21.13	38.00

°) Calculated with a factor 25 gms/1000 seed

The four most serious grassy weeds are wild oats, ryegrass, annual bromegrass and Phalaris sp. These weeds are most common to the sub-littoral and littoral regions. Dicotyledons are more of a problem on the high plateau, bromegrass is also a serious problem on the high plateau. Herbicides that are effective on the grassy weeds include the substitue ureas chlortoluron (Dicuron) and metoxuron (Dosanex); nitrophene (TOK50) and benzoylpropethyl (Suffix) for wild oats. The first three must be applied before the grassy weeds reach the three leaf stage to be effective. Primary absorption is by the roots, so rainfall soon after application is necessary for most effective control. These chemicals are also effective on some species of dicotyledons. TOK50 was used in combination with Dosanex or Dicuron. The combination is more effective on Phalaris sp. Combinations of Dicuron with MCPP (Printan 22), and Dicuron plus Certrol (MCPP + Ioxynil) increases the weed control spectrum. With the exception of Suffix, all of these herbicides are recommended to be applied after the cereal is in the three leaf stage and before the grassy weeds reach the three leaf stage. For the control of broad leaf species, 2,4-D is widely used. It must be applied after jointing starts and before boot stage to avoid damage to the cereal. This is often too late to avoid damage from early weed competition. To increase the length of the treatment season and reduce early competition, herbicides effective on broad leaf weeds are needed that can be applied before it is safe to use 2,4-D. Herbicides that were tested in Algeria that can be applied after the 3 or 4 leaf stage of wheat include Tribunil (methabenz thiazuron), Oxytril M (Ioxynil + Bromoxynil + MCPP), Certrol (Ioxynil + MCPP), Quinorexone Sp. (MCPP + Dicamba), DM68 (MCPP + Dinotexbe) and Actril M (MCPP + Ioxynil). With the exception of Tribunil all of these herbicides are combinations with MCPP (mecoprop) and all are more expensive than 2,4-D. However,

where heavy weed infestation from dicotyledons develops early, good yield increases have resulted from treatment with these products. TABLE P.3. summarizes the effect of herbicide treatment when the density of wild oats was less than 20 heads per square meter. Tribunil was applied early and controlled a heavy density of dicotyledons resulting in a yield response of 600 kg/ha. Control of the wild oats at this low density gave very little response to yield, however the average yield of the check was 2.1 to 3.2 tons per hectare.

TABLE P.3.

EFFECT OF HERBICIDE TREATMENTS ON WHEAT WHERE WILD OAT DENSITY WAS LESS THAN 20 HEADS PER SQUARE METER

ALGERIA 1975-76

Herbicide	N° Trials	% Increase	Q/H Increase	Q/H Check	% Weed Control	
					Wild oats	Dicotyledons
Tribunil	1	29.0	6.0	20.66	---	95
Suffix	3	2.2	0.83	27.30	90	0
Suffix + 2,4-D	2	5.5	1.76	31.92	80	95
2,4-D	2	6.7	2.2	31.92	---	95

When the wild oat density increased to about 75 per square meter there was an increase in the response to herbicides that controlled wild oats even though the yields were at the 3.5 to 3.8 ton level in the check plots. In one trial where there was very heavy dicotyledon infestation as well as some wild oats, the early control by DM68, Basagram and Oxytril M of these weeds gave yield increase of 3.8 to 6 quintals/ha but the check

yield was lower about 1.8 tons per hectare. In all of these trials there was no moisture stress from weed competition due to favorable rainfall throughout the growing season. These results are given in TABLE P.4.

When the wild oat density was in excess of 75 heads per square meter, there was a good response to herbicides that controlled wild oats. Also the yield level of the untreated plots was low, from 1.1 tons to 2.2. tons per hectare. The effects of the Suffix treatment may have been reduced by the heavy rainfall after treatment that encouraged the development of late tillers on the wild oats after killing the early tillers. Although Dosanex + TOK did not control all the wild oats, the combined control of wild oats and dicotyledons gave excellent yield response of 4.6 quintals per hectare. Dicuron + Certrol also gave similar control and yield response; TABLE P.5. summarizes these data.

In one trial with a high density of ryegrass and low density of wild oats, Dicuron + TOK50 controlled the ryegrass and increased the yield by 40%, with 90% of the ryegrass controlled. Dosanex + TOK50 and Printan 22 were less effective in controlling the ryegrass and the yield response was about half as much. These data are shown in TABLE P.6.

Dosanex + TOK50, Dicuron + TOK50, Printan 22 and Tribunil often show a yellowing of the wheat after application. This yellowing persists for one week to 10 days and then the wheat usually recovers completely. A slight delay in heading may result. Yield losses have not been measured from the early phytotoxic effects. There is a variety difference to the response. When the nursery was treated with Dosanex + TOK at El Khroub, crosses involving genetic material derived from Agropyron crosses, were severly injured. Recovery occurred but yields were decreased.

TABLE P.4. EFFECT OF HERBICIDE TREATMENTS ON WHEAT WITH DENSITY OF WILD OAT BETWEEN 20 AND 75 HEADS PER SQUARE METER, ALGERIA 1975-76

Herbicide	N° Trials	% Increase	Q/H Increase	Q/H Check	% Weed Control		
					Wild oats	Ryegrass Phalaris	Dicotyledons
Dosanex + TOK50	1	10.6	4.01	37.74	86	---	90
Printan 22	1	6.3	2.40	38.05	65	---	80
Dosanex	1	12.7	4.67	36.74	84	---	85
Buctril M	1	4.5	1.80	39.85	0	---	95
Tribunil	1	4.3	1.65	38.45	80	---	95
DM-68	1	34.4	6.24	18.15	0	0	90
Oxytril M	1	21.1	3.83	18.15	0	0	85
Basagram	1	33.6	6.10	18.15	0	0	50
Suffix	2	6.5	2.53	38.70	90	0	0
Suffix + 2,4-D	2	14.9	5.33	35.79	80	0	95
2,4-D	2	4.8	1.91	40.01	trace	0	95

TABLE P.5. EFFECT OF HERBICIDE TREATMENTS ON WHEAT WITH DENSITY OF WILD OATS IN EXCESS OF 75 HEADS PER SQUARE METER, ALGERIA 1975-76

Herbicide	N° Trials	% Increase	Q/H Increase	Q/H Check	% Weed Control		
					Wild oats	Ryegrass Phalaris	Dicotyledons
Dosanex + TOK50	4	40.4	4.64	11.34	70	65	75
Printan 22	5	19.6	2.50	12.71	55	58	83
Dicuron	1	18.7	2.20	11.74	40	60	58
Tribunil	2	23.0	3.45	14.95	28	52	88
Suffix	12	31.4	4.89	15.56	90	0	0
Suffix + 2,4-D	3	2.7	0.50	18.59	70	0	95
2,4-D	3	- 3.2	-0.71	22.07	trace	0	95
Dicuron + Certrol	4	39.6	5.13	12.95	70	60	70

TABLE P.6. EFFECT OF HERBICIDE TREATMENTS ON WHEAT WITH A HIGH DENSITY OF RYEGRASS AND RELATIVELY LOW DENSITY OF WILD OATS, ALGERIA 1975-76

Herbicide	% Increase	Q/H Increase	Q/H Check	% Weed Control		
				Ryegrass	Wild oats	Dicotyledons
Dosanex + TOK50	17.8	3.20	18.00	50	---	80
Printan 22	16.9	3.04	18.00	50	---	80
Dicuron + TOK50	40.2	7.24	18.00	90	---	80
Tribunil	4.4	0.80	18.00	--	---	80
Suffix	6.7	1.20	18.00	--	90	--

One observation is evident. When wild oat population exceeds 75 to 100 per square meter, the yields were low, even when adequate moisture and fertility were present. With high soil moisture lower levels of wild oat infestation were not as damaging as have been reported previously when moisture stress occurred.

4. Effect of Suffix on Wild Oat Seed Production

Counts were made on six trials for wild oat population per square meter in Suffix treated and untreated plots. From 10 heads at random, the number of wild oat kernels were counted from each m^2 sampled. Suffix usually kills the first tillers, or those at the time of treatment. However, if favorable conditions exist for regrowth after treatment some new tillers or late tillers will develop heads. These heads are usually small and often only one kernel per spikelet will develop. Some florets are completely sterile. The heads seldom grow above the wheat. If there is a dry period following treatment, and the wheat density is high, competition from the wheat usually stops all further tiller development of wild oats and few heads develop and seed. This low seed production is an important factor in wild oat control, because it reduces the amount reinfestations.

Suffix in combination with 2,4-D is less effective for wild oat control. Some reduction in yield and decrese in wild oat control was noted even when the two herbicides were applied in separate applications with a two week interval. Increasing the dose of Suffix to 9 liters per hectare and in combination with MCPA gave adequate control of both wild oats and broad leaf weeds for the past two years in the Algiers region without phytotoxic effects on the wheat. The cost of this treatment is too high to recommend. Suffix applied before the end of tillering is not effective.

New wild oat germination and lack of competition by the wheat at this stage reduces the effectiveness of the treatment.

TABLE P.7. shows the effects of wild oat seed production following Suffix treatment. Total seed production was reduced by 90%. Since most of the seed is returned to the soil by the high percentage of shattering in wild oats, the chance for future infestation is correspondingly reduced. At a seed weigth of 25 grams per 1000 kernels, an average of about 11 quintals/hectare of wild oat seed was produced on the untreated plots. The average for the treated plots was about one quintal/hectare.

TABLE P.7.

THE EFFECT OF SUFFIX TREATMENT ON WILD OAT DENSITY AND SEED PRODUCTION IN TREATED PRODUCTION FIELDS OF WHEAT IN THE CONSTANTINE REGION, 1975-76

Location	Variety	Wild Oat Heads and Seed Production					
		Suffix treated			Untreated		
		Heads m^2	Seeds per head	Total Seeds m^2	Heads m^2	Seeds per head	Total Seeds m^2
Khroub	INRAT 69	33	17	561	152	54	8208
	INRAT 69	4	15	60	33	32	1056
	Siete Cerros	2	10	20	57	32	1824
Khroub	Anza	47	12	564	154	49	7546
Guelma	Siete Cerros	37	18	666	108	44	4752
Ain El Bey	Siete Cerros	69	13	897	147	32	4704
	Mean	32	14.2	461	108.5	40.5	4681

5. Herbicide Treatments on Barley

Herbicide trials on barley were conducted at El Khemis and El Khroub. The herbicides were applied at recommended dosage and stage of growth with field sprayers. Harvest was with plot combine. All trials were heavily infested with wild oats.

Although barley is very competitive with wild oats, good yield response to herbicide treatments were obtained as reported in TABLE P.8.

The most promising herbicide for weed control in barley was a combination of Avenge and 2,4-D applied at end of tillering. Excellent control of both wild oats and dicotyledonous weeds were obtained with an excellent yield response. Avenge is very effective on wild oats and barley appears to be resistent on the varieties so far tested. It will not control dicotyledons species. Dicuron + Certrol and Dosanex + TOK50 also effectively controlled weeds in barley. Dosanex is somewhat toxic to barley, causing a yellowing after treatment, but the barley apparently recovers with little damage. It does not control severla species of dicotyledons including Convolvulus sp. and wild carrot. Suffix is toxic to barley, reducing height and tiller development. It also causes some sterility. The application of 2,4-D reduced the yield slightly although good control of the dicotyledons was obtained. The height of barley was reduced about 10 cm by 2,4-D alone and with Avenge.

TABLE P.8. EFFECT OF HERBICIDE TREATMENTS ON BARLEY WITH HIGH DENSITY OF WILD OATS, ALGERIA 1975-76

Herbicide	N° Trials	Yield Q/H			% Increase	% Weed Control	
		Treated	Check	Yield Increase		Wild oats	Dicotyledons
Avenge	2	21.6	12.9	8.7	67	95	0
Dicuron	1	13.8	9.0	4.8	53	60	60
Avenge + 2,4-D	2	21.6	15.4	6.2	40	95	95
Dicuron + Certrol	1	23.7	18.0	5.7	32	90	90
Printan 22	1	21.0	18.0	3.0	17	50	85
Dosanex + TOK50	2	24.9	22.5	2.4	11	90	90
Suffix	1	18.0	18.0	0	0	90	0
2,4-D	1	26.6	28.7	- 2.1	-7	trace	98

B. DENSITY OF SOWING STUDIES

The speed of cereal seed multiplication can be increased by reducing the seeding rate in the initial increases of G1 and G2. Increasing the efficiancy of seed production in the early generations of production decreases the time necessary to produce adequate seed for commercial production. To study the most effective way to multiply early generations of seed production, Anza a bread wheat variety was seeded at 40, 80 and 120 kg/ha at row spacing of 17.5 cm, and also at 100 kg/ha with row spacing of 17.5 cm, 50 kg/ha at 35 cm row spacing and 33 kg at 52.5 cm row spacing. Stand count at emergence, tillering at harvest and yield data were determined. Seeding was done with a John Deere double disc drill at a depth of 5 cm. Seeding date was January 5, 1976, wheat was treated with 600 gr MA 2,4-D in early shooting, 2nd node. Increasing the row spacing to 35 cm and decreasing the seeding rate to 80 kg delayed heading date by two days. A four day delay in heading date occurred at the 52.5 cm spacing and 40 kg seeding rate.

TABLE P.9. summarizes the data. Yield was not decreased substantially by decreasing the seeding rate at the 17.5 cm row spacing. Yields were significantly lower at the 35 and 52.5 cm row spacings with the same seed density within the row. Tillering was inhibited slightly by the higher seed density within the row. Increased head size occurred at the lower seeding rates. The most effective seeding rate to obtain maximum multiplication was at the 40 kg rate with a row spacing of 17.5 cm with 117.1 quintals of seed produced for each 100 kg of seed. Increasing the row spacing also tended to increase weed population between rows, however rogueing is easier at the wide row spacing. Lower seeding rates increased seed multiplication more than increasing the row spacing, however more studies with different spacing combinations may be even more effective.

TABLE P.9. EFFECT OF SEEDING RATE AND ROW SPACING ON ANZA WHEAT, KHROUB STATION 1975-76

seeding rate kg/ha	row spacing cm	emergence plants m^2	heads m^2	calculated tillers per plant	Yield Qx/ha	Yield quintals per 100 kg seeded
120	17.5	258	624	2.4	55.43	46.19
80	17.5	172	562	3.3	53.93	67.37
40	17.5	86	453	5.3	46.83	117.08
CV %		2.6	6	---	3.5	
LSD^{05}		8.26	30.8	---	4.30	
100	17.5	236	590	2.5	51.52	51.52
50	35.0	115	391	3.4	42.67	85.34
33	52.5	80	325	4.1	35.62	107.94
CV %		7.8	9.3		8.5	
LSD^{05}		30.8	72		6.41	

Based on the results shown in TABLE P.9. about 3 times as much seed would be available for seeding G4 if G1 were seeded at 40 kg per hectare and G2 were seeded at 80 kg per hectare. Further research into row combinations allowing interrow cultivation needs to be studied to aid weed control in the initial G1 increase. If all generations were increased at the 40 kg/ha seed rate resulted in yield increases shown in TABLE P.9., over 7 times as much seed would be available after three generations of increase. This is especially important for the multiplication of a new variety.

C. EFFECT OF SEED DRILLS ON YIELD

Much of the commercial wheat in Algeria is poorly seeded, resulting in uneven stands with poor weed competition. Poor uneven seeding results from inadequate land preparation, unadapted seeding equipment and hand seeding.

A major portion of the seeding equipment now in use is not adapted to Algerian soil conditions. The seed drills are of too light construction to withstand the stresses of high speed seeding over the heavy soil which is often poorly prepared. Wide 6 meter drills do not allow for uniform seeding over uneven terrain. As a result the life of the seeder is short, often less than one year, and seeding is very irregular.

The type of furrow opener now employed does not penetrate the heavy soil, especially on poorly prepared seed beds. Often the seed is left on the surface and the seeding depth is highly variable. To overcome this problem, heavy constructed shovel type hoe or single disc drills are needed. The station has both types of seed drills and an evaluation of a comparative seeding between the Nordsten hoe drill and the Shearer hoe drill was made. Part of a good uniformly prepared field, seeding

of INRAT 69 a durum variety was done with a Nordsten seed drill. The seed rate was 120 kg/ha. The soil at this stage was too wet for optimum seeding. Two days later the remaining of this field was seeded with a Shearer seed drill at the rate of 80 kg/ha using the same variety.

TABLE P.10. presents the summary of the yield from the two different drills with 3 herbicide treatments to control weeds and the relative wild oat population in the two different seedings. Wild oat count and yield determination were taken from cuts in comparative weed density. Yields are an average of four 35 m^2 combine cuts (1.75 m x 20 m). The average yield increase was 67 % due to the different seeding equipment. The significance of this information is that seeding equipment is extremely important for maximum production. The Nordsten seeder under optimum conditions will do a satisfactory seeding job, however, it is not a good seeder when soil preparation is poor.

The Shearer seeder also combines a cultivation at the same time it seeds. This was particularly effective this year when soil moisture content was high. The seeding by the Nordsten was into a seed bed of high moisture which was already germinating weed seed. The wild oats and other weeds emerged before and along with the wheat causing extreme competition with the wheat. The germinating weeds were killed at the time of seeding with the Shearer combination cultivator and seeder, allowing the wheat to emerge ahead of the weeds and also decreased the density of weed growth. The wheat was more competitive and was able to develop without much weed competition. This is especially true when the wild oat density and wild oat seed production is compared for the two seeders. The reduction in the potential weed infestation for succeeding crops will be important.

TABLE P.10. COMPARATIVE YIELD OF INRAT 69 AND WILD OAT INFESTATION FROM SIDE BY SIDE SEEDINGS WITH NORDSTEN AND SHEARER DRILLS, KHROUB STATION 1975-76

Treatment	NORDSTEN				SHEARER			
	Wild Oats			Yield	Wild Oats			Yield
	Heads m^2	Seeds/spike	Seeds m^2	Qx/ha	Heads m^2	Seeds/spike	Seeds m^2	Qx/ha
2,4-D	--	--	--	30.08	--	--	--	39.60
Suffix	33	17	561	31.98	4	15	60	41.59
Check	152	54	8208	21.13	33	32	1056	38.00
Suffix + 2,4-D	130	18	2340	12.86	38	15	570	38.02
			Mean	24.00			Mean	39.30

The Suffix treatment control was affected by continuous rain which decreased the competitive effect of the wheat following treatment. The treatment stopped the growth of the wild oats and only secondary tillers developed that did not emerge above the wheat.

The total seed produced by the wild oats following treatment was reduced about 15 times. Suffix and 2,4-D combination, although there was a two week period between treatment, was less effective in controlling wild oats. The wheat height was reduced about 10 cm with this application and was especially noticable in the seeding of the Nordsten where extremely heavy wild oat stands had developed.

More comprehensive trials are planned for the coming year to evaluate different types of seeders.

IV. MEDICAGO RESEARCH

1. Summary of Medicago Research and Observations in 1975/76

Algeria started the introduction and experimentation with Medicago species during the 1973/74 crop season. Following poor results with the currently introduced Australian cultivars (Jemalong, Harbinger, Snail) on the high plateau in 1974/75, a variety trial was established at sowing rates approximating to:

(a) the rate sown in the establishment year, 10 kg/ha;

(b) the amount of seed expected to regenerate in the 3rd year (50 kg/ha); and

(c) 100 kg/ha corresponding to some later year.

Extremely cold conditions, including 10 days of snow at Ain-El-Hadjar (1000 m), the site of this trial, adversely affected the plant populations. All varieties were affected. In addition to the three cultivars mentioned above, Trifolium hirtum, "Kondonin", Medicago truncatula "Cyprus" and M. truncatula "Borung" were sown.

The only cultivars which showed any promise from this trial was firstly "Borung" which set seed profusely, secondly "Cyprus" and lastly "Jemalong". Snail and Harbinger persisted at low densities and produced a small amount of seed.

Results gained in 1974/75 suggested that there may be some benefit from sowing low densities of oats or barley with the Medicago in the establishment year to provide a more favorable microclimate for the young Medicago at high elevations.

This was tried in a factorial trial at Ain-El-Hadjar using three cultivars (Jemalong, Harbinger and Snail) at seeding rates up to 25 kg/ha, seeded

alone, with 10 or 30 kg/ha of oats, or 10 or 30 kg/ha of barley. The companion crops had no significant effects on plant survival. This was observed in another region (800 m) where 50 hectares of Medicago was sown in association with 30 kg/ha of oats. Seed yields from the trial are shown in TABLE M.1. The results indicate that there is a response to seeding rate right through the range for "Snail", and up to about 20 kg/ha for "Harbinger" and "Jemalong". At normal seeding rates, all three have similar performances. However at high density, "Snail" outperformed the others in both forage and seed yield. "Snail", however, is inconsistent in regeneration. Mostly, the complaints voiced in Algeria have indicated that there is too much seed germinating in the second year and that seed continues to germinate right through the wheat phase, even after the period of 2,4-D application thus reducing wheat yields.

On the other hand, reports have been received from parts of the high plateau that indicate very little regeneration for the present introductions. These factors and others (erect habit making it easily possible to overgraze, large smooth pod easily apprehended by sheep or lost by erosion), suggest that "Snail" does not suit Algerian conditions. If sowings are to continue with these cultivars on the high plateau, it is suggested that sowing rates should be increased up to 20 kg/ha mainly to ensure sufficient seed production for the coming years. Even at these densities, however, forage production is still minimal.

TABLE M.1.

SEED YIELDS FROM SEEDING RATE TRIAL - AIN-EL-HADJAR, 1975/76

Variety	Seeding Rate (Kg/ha)	Seed Yield (Kg/ha)
Snail	2.0	3.0
	3.3	6.5
	4.4	16.5
	6.3	10.5
	8.7	80.5
	11.6	92.0
	19.6	151.5
	24.9	269.0
Harbinger	2.1	4.3
	5.1	2.7
	7.7	59.8
	9.6	58.8
	11.2	81.8
	12.3	90.0
	19.6	125.0
	25.0	111.5
Jemalong	2.7	6.2
	4.1	10.9
	6.9	14.7
	11.4	38.2
	13.7	39.6
	18.5	53.5
	21.9	83.3
	25.0	107.0

Another variety by seeding rate trial was established at Tafaroui (60 m) using slightly differing rates from those above. In particular, "Snail" was sown at rates up to 40 kg/ha to establish how high the seeding rate could go before its effect was non-existent. The results are presented in TABLE M.2.

By plotting a "line of best fit" one can suggest that "Jemalong" and "Harbinger" reach a plateau of seed production in the region of 15 kg/ha seeding rate, whilst the optimum for Snail, under these mild conditions, appears to be somewhat higher, probably around 20 kg/ha. There is a response to seeding rate on Snail forage production right through the seeding rate range.

Wheat was sown into the Medicago research plots of 1974/75 at Sfisef (600 m). Medic growth was spectacular in that year but as the plots could not be grazed, there was a large grass weed buildup. The plots were sown to wheat using a seeder which persistently malfunctioned with respect to seeding depth and the wheat density was low. Finally due to intense weed growth, the plots were cut for hay in mid-May.

However several observations may be of interest:

(a) The nitrogen status of the crop was directly related to the forage production of the previous year. Thus wheat after "Snail" medic was the greenest closely followed by wheat after "Jemalong" then "Harbinger", "Paragosa" and finally "Clare" subterranean clover.

(b) Similarly the nitrogen status of the crop was best where the previous medic had been early sown.

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TABLE M.2. RESULTS OF SEEDING RATE TRIAL - TAFAROUI, 1975/76

Seeding Rate (Kg/ha)		Establishment		Forage Yield (Fresh Wgt, Tonnes/ha)			Seed Yield (Kg/ha)	
		Plants/ m^2	% Seed	Sown Medic	Other Legumes	Grass Weeds	Sown Medic	Other Medics
Jemalong	2.7	60.7	23.9	0.6	6.6	10.1	126.3	111.7
	4.1	90.9	44.0	1.8	8.0	6.7	163.7	102.2
	6.9	153.9	38.7	4.3	6.9	6.1	179.0	40.8
	11.4	256.0	51.8	5.8	3.7	6.7	231.6	38.7
	13.7	305.8	55.9	7.0	5.0	3.4	317.9	33.4
	18.5	414.4	50.0	7.5	5.2	3.2	400.5	17.5
	21.9	489.4	49.7	7.8	5.2	3.5	382.9	7.0
	25.0	560.7	49.8	8.2	3.8	3.3	409.9	12.6
Harbinger	2.1	27.5	39.9	0.4	5.2	6.9	46.7	86.0
	5.1	74.5	64.2	1.1	7.0	6.3	111.2	62.9
	7.7	115.0	45.4	2.8	7.0	4.2	123.0	67.1
	11.2	198.0	54.0	5.3	5.4	2.6	289.6	41.9
	13.4	238.5	54.4	5.7	5.1	2.7	301.7	22.6
	15.6	221.0	43.5	6.2	5.4	2.3	326.1	10.6
	17.4	308.0	54.0	6.0	5.2	2.1	266.3	16.5
	19.6	328.0	51.1	6.1	6.4	1.6	289.6	9.3
Snail	3.3	17.5	88.4	0.4	7.9	5.6	191.3	64.1
	4.4	25.5	98.8	0.7	9.3	5.4	205.8	76.7
	11.6	45.5	65.8	4.1	5.6	4.2	286.1	56.1
	19.6	87.5	75.2	9.8	6.1	4.1	496.5	----
	24.9	109.5	74.1	10.9	5.9	3.1	513.2	16.9
	33.2	144.5	73.2	15.4	4.4	2.6	571.1	23.7
	38.4	169.5	74.3	16.3	2.0	1.9	591.3	5.1
	40.2	199.0	83.4	19.6	1.3	1.2	527.0	5.6

(c) Phosphate application rate to the previous Medicago had no visible effect on nitrogen accretion as indicated by crop colour. In fact phosphate application rate (some plots had not received phosphate either year) had no effect on crop growth.

(d) All wheat after medic plots were inferior to wheat after fallow (sown with the same drill) but were superior to wheat following a "weed fallow".

(e) Germinations of the medics occurred during early autumn during the preparation for the wheat crop. "Jemalong" and "Harbinger" were controlled by these cultivations. However Snail had further, later germinations, adding to the "weed" problem in the crop.

2. Survey of Commercial Medicago Sowings in 1975/76

Medics have now been sown on some 10,000 hectares in Algeria. However, the success of these sowings has not been registered or analysed. There is a certain amount of feed-back from the Demonstration Program carried out by FAO, but it seemed desirable to study all sowings to obtain an idea of the problems associated with the introduction of this new rotation with a view to modifying it, to better fit the peculiarities of the Algerian farming system. This was attempted by a survey carried out in spring and summer.

Forty-two domaines were visited during May, plant survival and botanical compositions were obtained and the farm management interviewed. The farms were again visited in July to take seed harvests and obtain data such as further grazing in the period since the previous

visit. As an opening comment, one could say that the farm managements are enthusiastic about medic during the first year. For this reason, farms which have had medic for one year have virtually all requested more seed for the following year. However, the enthusiasm rapidly wanes after the first crop of wheat after medic. These crops have been extremely weedy and thus, low yielding. There are instances where the farm is unlikely to ever again accept the idea of the Medic-Wheat rotation.

The survey was conducted in the western region of Algeria and this area has been divided into altitude zones: 0-500 metres; 500-800 metres; 800+ metres. These zones differ in the indigenous roadside vegetation as shown in TABLE M.3., the data being an average of Levy Point Suadrat data through the zones.

TABLE M.3.

BOTANICAL COMPOSITION OF GRAZED ROADSIDE VEGETATION

Zone (metres)	Botanical Composition %			Bare Ground (hits/100 points)
	Legume	Grasses	Broadleaf	
0 - 500	38	53	9	4
500 - 800	31	26	43	4
800 +	13	55	32	36

As can be seen, the legume component decreases with altitude. In fact, this year, above 1000 metres the legume component was as low as 3%. There is a shift from grasses to broadleaf plants in the

mid-altitude range and then a switch back at high altitudes where ryegrass becomes prominent. Wild oats is the predominant grass at low altitudes in association with Brome.

Spring survival populations of the medics sown were collected in May. These data represent the end-product of many factors which are difficult to separate - efficiency of seeding, grazing practices, insect attack, but the averages do show that the sown medic pastures follow somewhat the same pattern as the indigenous grazed swards. In TABLE M.4., plant populations are calculated as a percentage of seed sown (date from Domaines which had made gross errors are not included).

TABLE M.4.

SURVIVAL OF MEDICAGO(IN SPRING) AS % SEED SOWN

Zone (metres)	Survival (% seed)
0 - 500	26.0
500 - 800	17.4
800 +	3.8

The botanical composition of the grazed, sown, Medicago pastures are shown in TABLE M. 5.; data from the three regions is averaged over the Domaines of any one altitude zone (Domaines which had made gross errors deleted).

TABLE M. 5.

BOTANICAL COMPOSITION OF SOWN MEDICAGO PASTURES

Zone (metres)	Botanical Composition (%)				Bare Ground (hits/100 points)
	Sown Medicago	Other Legumes	Broadleaf	Grasses	
0 - 500	54.2	5.3	12.9	27.6	40.0
500 - 800	35.6	8.6	10.8	45.0	50.0
800+	1.7 °)	---	6.0	92.3	73.0

°) Limited sample - One Domaine only

It is immediately apparent that in the sown pastures too, the Medic component of the botanical composition decreases with altitude. At the same time, the grass component increases with altitude. The broad-leaf weed component is relatively small, due (probably) to 2, 4-D treatment during the cereal phases of the wheat-fallow rotation (as distinct from the roadside vegetation which would be rarely touched by 2, 4-D application). In addition, pasture availability (total forage) decreased with increasing altitude. Although no herbage yield determinations were taken, the bare ground counts indicate this decrease. Seed yields were determined in July. Of forty-two Domaines, only twenty-four were harvested, the remaining 18 Domaines having only a trace of seed production.

Summarised in TABLE M. 6. is the seed production of those Domaines that did, in fact, yield seed (averaged for each zone).

TABLE M. 6.

SEED PRODUCTION OF SOWN MEDICAGO PASTURES

Zone	Sown Medic		Indigenous Medic		Domaines	
(metres)	Yield (kg/ha)	Range (kg/ha)	Yield (kg/ha)	Range (kg/ha)	N° with Seed Yield	Total N° Sown
0-500	153.3	392 - 29	7.5	141 - 0	19	29
500-800	60.6	119 - 3	2.5	12.3-0	5	10
800+	---	---	---	---	0	3

Thus in the 0-500 m zone, only 19 out of a total of 29 Domaines which sowed medic this year have any seed production for regeneration. In the mid-altitude zone, only 5 out of the 10 Domaines produced any seed. Many of those Domaines, however, did not produce enough seed to ensure a high plant population for the primary regeneration year.

To successfully start the rotation, one should aim at a regeneration germination approaching that obtained from 25 kg/ha of pure germinating seed. This is equivalent to a seed production of about 200 kg/ha from the establishment year (taking into account hardseededness).

Of the Domaines studied in western Algeria this year, only 12% had seed yields greater than 200 kg/ha (TABLE M.7.).

TABLE M.7.

CLASSIFICATION OF MEDIC PASTURES BY SEED YIELD

Seed Yield (Kg/ha)	% of Domaines Sown
0 - 100	71
100 - 200	17
200 - 300	7
300 - 400	5

Of this 12%, the Domaines having seed yields of 300-400 kg/ha (5%) were either ungrazed or only lightly grazed, leading to high weed populations, and thus problems in the following crop year. Therefore, only 7% of all Domaines sown to medic in western Algeria could be considered ideally successful. However, if one reduces the seed yield objective to 100 kg/ha (ensuring a regeneration in year 3 of about 12-15 kg/ha; - equivalent to the original seeding rate) then perhaps 20% (disregarding those with weed problems) could be considered successful.

3. Some Observations from the Medicago Survey

(A) Seeding Method:

Three seeding methods are common in western Algeria:

-(a) Medic seeded through the boot of the drill

-(b) Medic dropped onto the surface (tubes removed from the drill) and then harrowed

-(c) As for (b) above, but followed by a sheeps'-foot type roller ("Crosskill" roller).

From the survey results, (b) and (c) appear to have given similar results. Seeding method (a) was only used with Snail medic, a large-seeded cultivar which has a fair tolerance to seeding depth variations - with the type of soil preparation, etc., common in Algeria, it is reasonable to suggest that this method would give inferior results for seeding the smaller-seeded cultivars.

(B) Utilization of the forage:

There were wide variations in grazing pattern and intensity observed over the Domaines surveyed. At the end of May only 29% of the Domaines could be considered to be well grazed; 27% were overgrazed and 26% under-grazed (disregarding domains which used Medicago pastures for other purposes).

The overgrazing was of two types - firstly, some Domaines had commenced grazing at the optimum time (December-January) but the stocking rate was too high. An additional factor was the encroachment (often at night) by nomad flocks.

Secondly, due to poor extension of the techniques involved in grazing medic, some Domaines made gross errors. The chief error was to leave the pasture until April before commencing the grazing. The pasture was then stocked with up to 50 sheep per hectare. This, of course, caused severe damage to the erect medic plant. This grazing system completely eliminated the medic component (in particular, Snail medic) from a number of fields.

As a preliminary estimate of optimum stocking rate, it was possible to plot botanical composition of the pastures against "stocking rate" (corrected for differences in method of grazing). If one assumes the primary objective is to obtain the greatest proportion of Medic in the

pasture and the least proportion of grassy weeds, the point where this occurs is where the stocking rate was 7.5 sheep/ha, grazing from December-January until the end of May.

There were large losses of seed between formation and the time of the survey seed harvest (July), due to continued grazing over that period. At the end of July, it was estimated that 78% of the Domaines were overgrazed. This continued grazing was sometimes the fault of the Domaines themselves, but also it was due to nomadic grazing. Thus as an interim measure (until there is better extension of technology; exclusion of nomadic grazing) it is considered that the first-year medic fields should be cultivated to (bury) the pods immediately following plant senescence (June). The grazing pattern and intensity naturally affects the weed component of the pasture.

Wild oats appeared to be well controlled by early, continuous grazing. Ryegrass, too, can be held in check by this method. However Brome presents a far more difficult problem. Early grazing may be an aid to control but it appears that grazing pressure should be increased during spring to prevent head formation. This is rarely possible in Algeria where localised sheep populations are reasonably low. The other alternative is to "top" the pasture, using a slasher (or reciprocating mower with a height control wheel). It is necessary to carry out this operation two or even three times. Even then, it is only partially successful as the Brome seeds progressively lower after each cut.

From the survey, it appears that 37% of the area sown to medic in 1975/76 will have a substantial Brome problem in the following wheat crop.

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(C) Insect Pests:

Several subspecies of Sitona lineata caused varying amounts of damage to 1160 hectares (43% of the total area) sown to Medicago in 1975/76. It caused the all but total destruction of nearly 200 hectares. Chemical control is difficult as the chemicals which are effective (azinphos ethyl and fenitrothion) are expensive and non-residual. As the adults have a large flying range, re-infestation is rapid. Of its predators, two insects are known to exist in Algeria - Microtonus aethiops and Pygostolus fulcatus. In addition, a fungus parasite, Beauvaria spp is also present in Algeria. It is hoped therefore that control will be by biological means, although it must be realized that this type of control will give rise to occasional (cyclic) attacks on medics by Sitona.

4. General Conclusions Regarding Medicago, 1975/76

(a) If sowings of Australian cultivars of Medicago are to continue on the high plateau, they should be confined to M. truncatula, "Jemalong", sown at 20 kg/ha. For the future, M. truncatula, "Borung" may prove superior to "Jemalong" in this zone.

(b) For the littoral and sub-littoral zones also, "Jemalong" appears to be the best adapted variety, sown at rates up to 15 kg/ha. "Harbinger" (M. littoralis) may be of value on some sandy sites. "Snail" should be completely phased out of the program.

(c) The medics should be sown early, (October) in all zones.

(d) Continuous grazing should commence early (December-January) in 0-500 metre zone; February-March in the 500-800 metre zone - when the medic has 4-6 trifoliate leaves) with a stocking rate

approximating to 7.5 sheep per hectare, adjusting the stocking rate (where possible) according to pasture availability, particularly with regard to weed control.
Grazing should be terminated at the end of May and the field superficially cultivated immediately following plant senescence.

(e) There is an urgent requirement for a herbicide to control Brome in cereals in Algeria.

(f) For the Medic-Wheat rotation to be successful in (western) Algeria, it is necessary for continued and greatly intensified extension of technical information to the Domaines and also very much improved supervision of field sowings of Medicago.

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