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SESAME RESEARCH REPORT

1992-93 WET SEASON

KATHERINE

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SUSTAINABLE AGRICULTURE

THE DEPARTMENT OF PRIMARY INDUSTRY AND FISHERIES IS COMMITTED TO THE PRINCIPLES AND PRACTICES OF SUSTAINABLE AGRICULTURE

Definition:

Sustainable agriculture is the use of practices and systems which maintain or enhance:

- the economic viability of agricultural production;
- the natural resource base; and
- other ecosystems which are influenced by agricultural activities.

Principles:

1. Agricultural productivity is sustained or enhanced over the long term.
2. Adverse impacts on the natural resource base of agricultural and associated ecosystems are ameliorated, minimised or avoided.
3. Harmful residues resulting from the use of chemicals for agriculture are minimised.
4. The nett social benefit (in both dollar and non-dollar terms) derived from agriculture is maximised.
5. Agricultural systems are sufficiently flexible to manage risks associated with the vagaries of climate and markets.

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1. Introduction

There has been substantial research in identifying crops which are possible alternatives to maize, soybean, mungbeans and sorghum for the Northern Territory.

One crop that has shown potential for the Katherine region is sesame. Intensive research with sesame was initiated in the 1987-88 wet season. Research since then has included cultivar, sowing date, population, crop establishment, nutrition, weed control, disease monitoring, harvesting and seed maintenance experiments. Development of pure Yori 77 seed and an improved cultivar for northern Australia has been given the highest priority. This research was jointly funded by Grains Research and Development Corporation and Rural Industries Research and Development Corporation.

Acknowledgments

I thank Mr. D. Beech (CSIRO) for his advice and encouragement with the selection of the new sesame genotype for northern Australia. Mr. D. Hansen and Mr. A. Simonato are acknowledged for testing sesame seedling vigour, and Mr. I. Cook for statistical analysis of the sesame genotype data.

2. General Methods

2.1 *Sites and Soils*

The experiments for the 1992-93 season were undertaken at Katherine Research Station (14^0 28"S, 132^0 18"E) Douglas Daly Research Farm (13^0 51"S, 132^0 12"E), and Western Creek Station (≈ 15^0 35"S, 133^0 13"E). The soil type used at Katherine was a Fenton clay loam, (Lucas *et al.* 1985) while a Venn sandy loam was used at Douglas Daly and a Oolloo clay loam at Western Creek Station. Soil fertility analysis is presented in Table 2.1.

2.2 *Seasonal Conditions*

At Douglas Daly and Katherine, the wet season was characterised by very good land preparation rains in November and December. At all sites the lack of suitable rainfall for sowing during January meant that the experiments were sown late in this month. Rainfall for the end of January and February was above average with only isolated storms during March.

During the season rainfall at Larrimah was erratic and well below average. Total rainfall at Douglas Daly, Katherine and Western Creek Station was 1132 mm, 902 mm and 523 mm respectively (Table 2.2).

2.3 *Land Preparation and Weed Control*

All sites were conventionally prepared in December; any weed regrowth was controlled with an application of Round-up CT® @ 2.0 L/ha.

At Douglas Daly, Treflan® @ 1.2 L/ha was incorporated on 11 January while at Katherine and Western Creek Station, Dual® @ 1.5 L/ha was sprayed on 14 January and 5 January respectively. Soil physical conditions at all sites was dry at the time of herbicide application.

2.4 *Fertiliser Application*

Katherine site

The research areas were fertilised with a basal application of single-superphosphate @ 150 kg/ha (approx. 13.5 kg P/ha and 15 kg S/ha), on 21 December 1992. Urea was incorporated @ 90 kg/ha (approx. 41 kg N/ha) on 29 December. The experiments were top dressed (but not incorporated) with urea at 60 kg/ha (approx. 28 kg N/ha) at 28 DAS.

Douglas Daly site

The research area was fertilised with applications of single superphosphate plus trace elements at 130 kg/ha (approx. 11 kg P/ha) and 50 kg/ha of muriate of potash (approx. 25 kg K/ha) on the 18 January. The area was top dressed (not incorporated) with urea @ 30 kg N/ha at 14 DAS and 28 DAS.

Larrimah

The research area was fertilised with single-superphosphate at 106 kg/ha (approx. 10kg P/ha) and urea @ 45 kg/ha (approx. 20 kg N/ha) on the 23 December 1992. The experiment was top dressed (not incorporated) with urea @ 40 kg N/ha at 38 DAS.

2.5 *Insect Control*

Douglas Daly
Beetles *(Oncocoris hackeri)* were sprayed on 27 February with the insecticide Endosulphan @ 2.0 L/ha.

Katherine
Caterpillars *(Antigastra catalaunalis)* were sprayed on 23 February and 18 March with Endosulphan @ 2.1 L/ha, while *Chrysodeixis eriosoma* caterpillars were treated @ 2.0 L/ha on 4 March.

Larrimah
Caterpillars *(Antigastra catalaunalis)* were identified but not controlled.

Table 2.1 Soil nutrient status at Katherine, Western Creek Station and Douglas Daly

Soil analysis (0-15cm)	Katherine	Western Creek Station	Douglas Daly
Cond (ms/cm)	0.14	0.05	0.04
pH	6.50	6.90	6.20
Avail. P (ppm)	17.00	26.00	8.00
Avail. K (ppm)	350.00	147.00	91.00
Avail. Ca (ppm)	1260.00	454.00	218.00
Avail. Mg (ppm)	290.00	63.00	36.00
Avail. S (ppm)	12.00	12.00	3.00
Avail. Cu (ppm)	3.80	1.10	0.30
Avail. Zn (ppm)	1.80	2.50	0.20
Avail. Mn (ppm)	17.00	20.00	37.00
Avail. B (ppm)	0.20	0.20	<0.20
Total N (%)	0.18	0.05	0.03

Table 2.2 Rainfall, pan evaporation, radiation and mean temperatures at Katherine, Larrimah and Douglas Daly

	Nov	Dec	Jan	Feb	Mar	Apr	May	
Monthly Rainfall (mm)								**Total**
Douglas Daly	123.1	171.6	390.3	389.2	59.5	0.0	0.0	1133.7
Katherine	116.4	136.3	371.2	239.3	39.0	0.0	0.0	902.2
Larrimah	22.0	97.3	2221.1	173.0	9.9	0.0	0.0	523.3
Mean (1)	108.5	142.9	269.2	303.2	253.6	46.6	7.5	1131.5
Mean (2)	83.3	191.6	228.6	210.2	162.7	32.8	5.1	914.3
Mean (3)	63	115	205	186	149	32	12	762
Mean Maximum Daily Temperature (^{0}C)								
Douglas Daly	N.A.	37.5	35.2	33.7	36.6	37.2	36.0	
Katherine	36.6	36.6	33.8	32.1	35.2	34.9	33.1	
Larrimah	38.9	38.2	36.1	32.3	36.2	35.2	32.5	
Mean (1)	36.6	35.3	33.6	32.9	33.2	33.4	32.0	
Mean (2)	37.8	36.2	34.6	34.1	34.3	33.9	32.0	
Mean (3)	38.0	37.1	35.6	34.6	34.0	33.9	31.7	
Mean Minimum Daily temperature (^{0}C)								
Douglas Daly	N.A.	23.3	23.6	24.0	23.2	21.0	20.4	
Katherine	24.5	24.6	23.5	23.4	22.7	20.2	18.1	
Larrimah	26.1	25.3	24.9	N.A	23.0	21.6	19.1	
Mean (1)	24.2	24.0	23.7	23.7	23.0	20.6	17.1	
Mean (2)	24.3	23.9	23.7	23.4	22.3	19.5	16.2	
Mean (3)	24.4	24.5	24.1	23.7	22.7	19.8	16.6	
Mean Daily Radiation (MJ/m^2)								
Douglas Daly	N.A	N.A	N.A	N.A	N.A	N.A	N.A	
Katherine	24.3	24.9	21.1	18.8	23.8	21.0	18.0	
Larrimah	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A	
Mean (1)	24.5	24.2	22.4	21.4	21.7	22.6	21.1	
Mean (2)	24.6	24.2	21.9	22.5	21.7	21.7	22.0	
Mean (3)	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A	
Mean Monthly Evaporation (mm)								
Douglas Daly *	N.A.	182	146	188	206	196	225	
Katherine	236	218	207	152	161	188	174	
Larrimah	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A	
Mean (1)	252	226	168	146	N.A.	231	208	
Mean (2)	275	242	194	156	173	186	180	
Mean (3)	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A	

* estimate as some values were missing
N.A. Not available
(1) Douglas Daly (2) Katherine (3) Larrimah

3. Evaluation of sesame genotypes in the 1992-93 wet season

Abstract

A range of sesame genotypes were evaluated at Douglas Daly Research Farm, Katherine Research Station and Western Creek Station in the 1992-93 wet season. Establishment of the genotypes was successful at Douglas Daly and Katherine, while emergence of sesame seedlings at Western Creek occurred as 2 separate events due to the rainfall pattern.

All genotypes at Douglas Daly and Katherine produced their flowers by 43 days after sowing (DAS) and completed flowering by 74 DAS. Highest yield was recorded by the selection PB:64 at all sites. All sesame genotypes at Douglas Daly and Katherine produced higher yields than Yori 77.

Introduction

Sesame is considered a potential crop in the semi-arid tropics of north west Australia. Extensive genotype evaluations were undertaken in the Ord River Irrigation Area (ORIA) during the 1981-83 wet seasons. The best material from ORIA was evaluated in the Northern Territory in the 1986-87 wet season. Three cultivars indicated potential suitability; these were Hnan Dun, Yori 77 and Pachequino.

Since then further introductions from the University of Western Australia have been evaluated against Yori 77 for potential seed yield, seed quality and resistance to shattering.

Generally, characteristics of the sesame ideotype considered suitable for growing in the Northern Territory include;

a) Maturity by late April for crops planted in early January.

b) Tolerance to Sesame Leaf Roller, *Antigastra catalaunalis*.

c) Tolerance of diseases, *Corynespora cassiicola* and *Cercospora sesamicola*.

d) Grow no taller than 1.5 m, set capsules from approximately 50 cm above the ground and develop 2 branches.

e) Capsules should be long and narrow, though not crowded on the central stem or branches, while the apex gap of capsules should be narrow.

f) The seed should be large, white and have a high oil content. The seed must not have a bitter taste.

Materials and Methods

Design, treatments and management

Experimental design was a randomised complete block with 4 replications of 9 genotypes. Genotypes were Hnan Dun (early maturing) Pachequino and Yori 77 (mid maturing), and selections H:1, H:11, Y1:44, Y5:83, PA:45 and PB:64. Plot size was 8 rows x 3.0 m; row spacing was 32 cm.

The experiment was sown by hand at all sites. All seed was treated with Lorsban® 25WC @ 160 g/100 kg seed to prevent false wire worm damage.

The sites and dates of sowing are as follows;
. Douglas Daly Research Farm - 21 January 1993

. Katherine Research Station - 17 January 1993
. Western Creek Station - 4 January 1993

Seed at the Katherine site was sown into a dry seed bed on the 14 January. However the date of sowing was taken as the 17 January as this was date of the first rainfall after 'dry' sowing.

Plants were thinned to an intra-row spacing of 10 cm (equivalent to 300 000 plants/ha) approximately 14 DAS.

Recordings and Data Collection

During the season phenological data was recorded. These included date of first flower, date of 50% plants flowering and date of physiological maturity (95% of capsules being yellow).

At Katherine, plant height, leaf number, leaf area and plant weight were measured on 2 plants from each plot at 50% plants flowering and completion of flowering.

At physiological maturity, 5 plants were selected from the end of the centre row from each plot for yield component analysis. The following were recorded;

a) Plant height
b) Height of lowest capsule
c) Number of branches
d) Node of lowest capsule
e) Number of capsules on central stem
f) Number of capsules on branches
g) Capsule length (middle third reproductive stem)
h) Capsule width (middle third reproductive stem)
i) Apex gap of capsule
j) Oven dry stem weight
k) Oven dry capsule weight
l) Oven dry seed weight

From this data, harvest index and seed weight/total capsule weight ratio were calculated.

At maturity, plant population and seed yield were recorded by harvesting 1.75 m from the central 6 rows of each plot. Samples were threshed and cleaned, sub-samples were set aside of 1000 seed weight, seed colour, seed palatability, seedling vigour, % oil and % N and germination determinations.

Results

Emergence of the sesame genotype experiment at Western Creek Station (WC) was bimodal due to the nature of the rainfall in January. No attempt was made to analyse data from Western Creek due to influence of the 2 emergence dates.

Phenology

All genotypes at Douglas Daly (DD) and Katherine (KT) produced their first flower between 30 and 43 DAS, 50% plants were flowering between 38 and 50 DAS, with completion of flowering between 65 and 74 DAS (Table 3.1).

All genotypes at both sites flowered earlier than Yori 77.

Morphology at 50% plants flowering at Katherine

At 50% plants flowering, all genotypes were shorter in stature, produced fewer leaves and leaf area, and had of a smaller biomass than Yori 77 (Table 3.2). Plant development reflected time to flowering. The longer the time to flowering the larger the plant at 50% plants flowering.

Morphology at completion of flowering at Katherine

At this growth stage, Hnan Dun and selection H:11 were taller than Yori 77 while the remaining genotypes were of similar in stature to Yori 77 (Table 3.2).

There was no significant difference in leaf area or plant biomass between sesame genotypes. Leaf area was generally larger at completion of flowering than at 50% plants flowering. A decrease in leaf area was expected due to the change in leaf design as the plant flowers. As sesame flowers it develops narrow leaves along the reproductive section of the stem as opposed to the broad and larger leaves below the reproductive stem section.

Plant population and potential seed yield

Mean populations of the genotypes at Douglas Daly and Katherine were 287 and 257 x 10^3 plants/ha respectively (Table 3.3). The significant difference in plant population recorded for Katherine was not a problem as plant numbers were between 200 and 400 x 10^3 plants/ha, it is within the range that plants are able to compensate in seed yield for variations in plant population.

Mean seed yield for all genotypes at Douglas Daly and Katherine were 1069 kg/ha and 1084 kg/ha respectively (Table 3.3). Highest yield at both sites was for PB:64 with 1308 kg/ha (DD) and 1315 (KT) kg/ha respectively. All genotypes produced higher yields than Yori 77.

Yield components

Plant height.

At all sites the genotype H:1 was the shortest in stature (Tables 3.4, 3.6 and 3.8). No genotypes were too tall (>150 cm) to make mechanical harvesting difficult. All genotypes were generally less than 120 cm tall.

Height of lowest capsule

Yori 77 and H:11 developed their capsules the highest distance above the ground (>69 cm at DD and KT). Only the genotype H:1 developed capsules at what is considered the optimum height for the lowest capsule, approx. 30 cm (Tables 3.4, 3.6 and 3.8)

Branching habit

Hnan Dun, H:1 and Yori 77 exhibited a branching habit (Tables 3.4, 3.6 and 3.8), while the remaining genotypes were characterised as single-stem types. Branching is a desirable characteristic with the optimum number of branches being 2 per plant for high seed yield and compactness of maturity.

Node of lowest capsule

Sesame genotypes at DD generally aborted their first capsules, with capsules being set at lower node numbers at KT and WC. All capsules were set at a node number higher than the 6th (Tables 3.4, 3.6 and 3.8).

Number of capsules on central stem and branches

Generally single stem genotypes produced more capsules on the central stem than branching types (Tables 3.5, 3.7 and 3.9). The genotype H:11 developed the lowest total number of capsules with 29.3 at DD and 31.6 at KT.

Capsule length

The longest capsules were developed by H:1 and H:11, while Yori 77 developed the shortest capsules (Tables 3.5, 3.7 and 3.9). (Note, the percentage of seed lost from long capsules are expected to be less than that from shorter capsules if the apex gap of the capsule is similar).

Capsule width

Yori 77 generally developed the narrowest capsule width while PA:45 generally developed the widest capsule width (Tables 3.5, 3.7 and 3.9). Capsule width ranged between 5.4 mm and 6.8 mm.

Apex gap of capsule

The larger the apex gap of the dehisced capsule the greater the seed loss when the plant is disturbed. No individual genotype developed the widest or narrowest gap consistently across sites though Yori 77 generally dehisced less than the other genotypes this season (Tables 3.5, 3.7 and 3.9).

Seed germination at harvest

The genotypes H:1, Y1:44, PA:45 and PB:64 contain a proportion of fresh ungerminated seed (Table 3.10, 3.11 and 3.12). The fresh ungerminated seed is an indication of the level of seed dormancy. This is a favourable characteristic to have at maturity as seed dormancy prevents seed from germinating in the capsule in the event of a late storm. As the seed ages in storage the percentage of fresh ungerminated seed decreases.

Seed colour and taste

Market requirement for sesame is white seed with no bitter taste (ie. off-flavours). Yori 77 is taken as a standard for these characteristics, generally having white seed of good taste, while Hnan Dun produce brownish white seed of reasonable taste. (Hnan Dun also contain a small percentage of off-types with dark brown and black seed). The genotypes H:1 and PB:64 exhibited the best seed colour and taste characteristics (Tables 3.10 and 3.111).

Generally there is little or no fresh ungerminated seed by the start of the next season. The percentage ranges from 2 to 54 for Yori 77 and H:1 respectively.

Seed oil and nitrogen content

Genotypes grown at DD and KT produced seed with a higher oil content than that of WC. Oil contents ranged from 57.4% to 53.7% for H:1 (DD) and H:11 (KT) respectively. Oil contents at WC ranged from

56.2% (H:1) to 50.2% (Y5:83). Nitrogen content of sesame seed ranged between 3.69% and 4.95% for H:1 (KT) and Y5:83 (WC).

Seedling radicle length at 48 hours

Seedling vigour is based on radicle length measured 48 hours after having placed seed for germination under alternating temperatures of 25°C for 12 hours and 45°C for 12 hours. Yori 77, PB:64 and H:11 produced the most vigorous seedling with a mean radicle length >13 mm.

Harvest index at maturity

The genotypes Y1:44 and Y5:83 generally produced the highest harvest index at DD and KT while Yori 77 the lowest (Table 3.13). The higher the harvest index the more efficient the genotype is in partitioning assimilate to the capsules. Harvest index ranged between 26.0% and 37.8%.

Seed weight/total capsule weight ratio

The genotypes Y1:44 and Y5:83 generally produced the highest harvest index at DD and KT while Yori 77 the lowest (Table 3.13). The higher the seed weight/total weight ratio the more efficient the genotype is in partitioning assimilate between seed and capsule wall. The seed/capsule ratio ranged between 45.5% and 57.5%.

1000 seed weight

At DD and KT the largest seed was produced by Y5:83 and the smallest by Yori 77 (Table 3.14). Thousand seed weight ranged between 2.60 g and 3.40 g.

Susceptibility to lodging

During March 1993, Katherine experimental site was subject to violent storms. All genotypes lodged to varying degrees. Yori 77 was badly lodged (with approx. 60% plants affected) while the rest generally suffered minimal lodging being less than 10% (Table 3.14).

Susceptibility of Cercospora semamicola

All genotypes at KT were infected with *Cercospora sesamicola* (Leaf spot). This disease causes the abscission of the leaves. Hnan Dun, H:1, H:11 and Yori 77 were severely affected by this disease (Table 3.14).

Discussion

The 1992/93 wet season was the third and final year of this experiment ie. - Development of a sesame cultivar suitable for northern Australia.

The last 3 years of results will be combined and analysed. The final report will appear as a separate Incidental Report.

In this season 2 new genotypes, H:1 and H:11 replaced those discarded last year. Neither genotypes however indicated any characteristics superior to the current entries.

The genotype H:11 tended to be unsuitable for mechanical harvesting. Plant height and height of lowest capsule were taller than the current commercial cultivar, Yori 77. H:11 also produced relatively low seed yields and was susceptible to leaf diseases.

The genotype H:1 produced high seed yields, however it also was susceptible to leaf diseases.

Three genotypes (Y1:44, PB:64 and PA:45) again indicated high potential seed yields, good seed characteristics, and their resistance to leaf diseases. The genotypes selected for commercial release will probably be decided by seed characteristics, resistance to diseases and lodging from these 3 genotypes as seed yields are similar. Note: All 3 genotypes produced larger seed yields (300-400 kg/ha) than Yori 77.

Table 3.1 Phenology of sesame genotypes

	Days after sowing											
Genotype	First flower			50% plants flowering			Completion flowering			Physiological maturity		
	DD	KT	WC	DD	KT	WC	DD	KT	WC	DD	KT	WC[1]
Hnan Dun	33	30	43	42	38	51	71	68	83	NR	88	-
H:1	37	33	48	40	38	53	67	63	82	NR	83	-
Yori 77	43	34	49	48	49	60	73	68	84	NR	86	-
Y1:44	37	32	46	42	40	51	71	65	81	NR	87	-
PA:45	37	30	48	41	39	52	69	66	82	NR	86	-
Y5:83	39	33	47	42	40	50	72	66	84	NR	87	-
PB:64	38	31	47	45	40	51	70	66	82	NR	86	-
H:11	41	34	49	45	45	55	72	68	85	NR	86	-
Pachequino	38	34	54	50	43	60	74	68	83	NR	88	-
LSD (5%)	1.5	1.2	-	2.0	2.0	-	1.1	1.9	-	-	2.1	-

NR - not recorded, due to location of experiment the research site was desiccated at 98 DAS.
WC - data not analysed due to uneven emergence of plots.
[1] - Data lost

Table 3.2 Mean plant height, leaf number, leaf area and plant biomass at 50% plants flowering and completion of flowering for sesame at Katherine

	Plant height (cm)		Leaf number		Leaf area (cm^2)		Plant weight (g)	
Genotype	50FL[1]	CFL[2]	50FL	CFL	50FL	CFL	50FL	CFL
Hnan Dun	47.6	135.6	35.6	59.6	52.9	80.3	3.9	26.6
H:1	50.3	118.4	45.8	92.1	66.1	102.2	5.2	35.6
Yori 77	94.4	124.6	74.8	83.8	122.5	93.6	9.0	23.5
Y1:44	49.5	122.3	28.4	57.9	78.5	98.8	4.9	27.3
PA:45	50.9	117.1	29.5	45.9	78.0	77.6	4.9	25.1
Y5:83	47.5	120.9	31.1	44.3	71.2	66.7	4.6	19.5
PB:64	57.4	125.4	28.5	45.8	78.1	79.4	5.4	25.6
H:11	83.0	145.0	68.9	93.0	119.8	100.7	9.4	27.9
Pachequino	69.4	122.5	36.5	49.9	66.0	78.2	5.1	17.5
LSD(5%)	7.9	11.5	14.7	33.6	31.9	NS	2.5	NS

[1] 50FL = 50% plants flowering
[2] CFL = completion of flowering
NS = not significantly different (P=0.05)

Table 3.3 Sesame plant populations and seed yields

	Population (x 10^3)			Seed yield (kg/ha)		
Genotype	DD	KT	WC	DD	KT	WC
Hnan Dun	279	275	219	1060	1223	260
H:1	300	217	234	1176	1311	225
Yori 77	277	282	186	790	757	251
Y1:44	279	249	234	1162	1053	-
PA:45	297	237	122	1183	1131	-
Y5:83	279	263	283	1044	1048	272
PB:64	324	260	302	1308	1315	303
H:11	244	289	246	948	995	181
Pachequino	303	244	261	951	948	223
Mean	287	257	232	1069	1084	-
LSD (5%)	NS	32.6	-	281.1	262.8	-

WC - data not analysed due to uneven development of plots.

Table 3.4 Morphology of sesame genotypes at Douglas Daly Research Farm

Genotype	Plant height (cm)	Height lowest capsule (cm)	Number of branches	Node lowest capsule
Hnan Dun	122	68	1.0	9.1
H:1	99	37	1.1	5.8
Yori 77	119	69	0.7	7.5
Y1:44	112	60	0.1	8.4
PA:45	115	57	0.2	8.4
Y5:83	111	67	0.1	9.2
PB:64	115	69	0.4	9.2
H:11	118	78	0.4	8.4
Pachequino	114	73	0.0	9.0
LSD (5%)	9.6	10.6	0.76	1.35

Table 3.5 Morphology of sesame genotypes at Douglas Daly Research Farm

Genotype	Capsule no. (central stem)	Capsules per branch	Total no. capsules	Capsule length (mm)	Capsule width (mm)	Apex gap of capsule (mm)
Hnan Dun	31.3	10.4	41.6	28.2	6.1	7.2
H:1	22.2	7.5	34.7	29.1	6.0	7.4
Yori 77	41.7	8.1	49.1	23.7	5.8	6.2
Y1:44	40.1	3.8	40.9	25.6	6.3	6.0
PA:45	37.1	2.5	37.9	26.8	6.8	7.0
Y5:83	34.0	1.6	34.3	25.2	6.3	6.3
PB:64	34.4	4.1	36.7	26.2	6.5	7.0
H:11	25.4	10.8	29.3	29.1	5.9	7.8
Pachequino	30.1	0.0	30.1	26.7	5.8	7.2
LSD (5%)	11.26	7.05	NS	1.21	0.51	1.16

Table 3.6 Morphology of sesame genotypes at Katherine Research Station

Genotype	Plant height (cm)	Height lowest capsule (cm)	Number of branches	Node lowest capsule
Hnan Dun	119	58	2.3	7.0
H:1	108	45	1.7	6.0
Yori 77	118	83	1.5	9.5
Y1:44	108	54	0.4	6.2
PA:45	114	51	0.2	5.8
Y5:83	116	52	0.0	5.9
PB:64	114	48	0.0	5.9
H:11	132	88	1.6	7.7
Pachequino	109	55	0.0	6.5
LSD (5%)	12.8	9.3	0.55	0.87

Table 3.7 Morphology of sesame genotypes at Katherine Research Station

Genotype	Capsule no. (central stem)	Capsules per branch	Total no. capsules	Capsule length (mm)	Capsule width (mm)	Apex gap of capsule (mm)
Hnan Dun	22.1	8.0	41.6	29.2	5.9	7.4
H:1	29.2	9.7	46.9	31.7	5.9	7.4
Yori 77	29.3	6.9	39.5	24.8	5.6	4.4
Y1:44	43.8	2.8	45.7	27.8	6.5	6.1
PA:45	45.9	5.5	48.0	27.5	6.3	6.4
Y5:83	41.9	0.0	41.9	27.5	6.8	6.2
PB:64	58.7	0.0	58.7	26.7	6.5	6.0
H:11	21.2	6.7	31.6	30.5	6.1	6.1
Pachequino	33.8	0.0	33.8	26.9	6.2	6.5
LSD (5%)	12.46	5.80	NS	1.56	0.51	0.88

Table 3.8 Morphology of sesame genotypes at Western Creek Station

Genotype	Plant height (cm)	Height lowest capsule (cm)	Number of branches	Node lowest capsule
Hnan Dun	75	42	0.9	6.4
H:1	60	34	1.5	6.2
Yori 77	100	64	2.0	9.1
Y1:44	81	34	0.1	6.3
PA:45	76	31	0.1	5.7
Y5:83	70	44	0.0	6.2
PB:64	83	57	0.0	7.1
H:11	83	58	0.6	7.3
Pachequino	62	41	0.0	6.9
LSD (5%)	-	-	-	-

Table 3.9 Morphology of sesame genotypes at Western Creek

Genotype	Capsule no. (central stem	Capsules per branch	Total no. capsules	Capsule length (mm)	Capsule width (mm)	Apex gap of capsule (mm)
Hnan Dun	12.3	6.4	18.3	26.8	5.8	6.4
H:1	6.5	7.0	16.4	27.5	6.1	6.0
Yori 77	29.5	5.3	40.2	22.4	5.4	4.3
Y1:44	30.7	0.7	31.0	25.7	6.7	5.7
PA:45	29.2	1.0	29.3	26.4	6.7	5.8
Y5:83	12.4	0.0	12.4	25.6	6.4	4.9
PB:64	13.7	0.0	13.7	25.1	6.3	6.1
H:11	12.2	5.4	15.4	27.9	5.5	5.4
Pachequino	11.5	0.0	11.5	25.6	6.2	5.9
LSD (5%)	-	-	-	-	-	-

Table 3.10 Seed characteristics of genotypes grown at Douglas Daly Research Farm

Genotype	Seed Colour[1]	Seed taste[2]	Oil content (%)	Seed nitrogen (%)
Hnan Dun	2.7	5	57.2	3.75
H:1	7.0	4	57.4	3.60
Yori 77	8.0	7	56.4	3.37
Y1:44	7.2	5	55.9	3.80
PA:45	7.0	5	54.8	3.98
Y5:83	7.0	7	56.7	3.81
PB:64	7.7	5	55.9	3.80
H:11	7.7	5	55.1	3.86
Pachequino	6.5	4	56.4	3.47

1. Seed colour 1 = brownish white 10 = bright white
2. Seed taste 0 = tasteless 10 = bitter

Table 3.11 Seed characteristics of genotypes grown at Katherine Research Station

Genotypes	Germination normal (%)	Fresh ungerm. (%)	Seed colour[1]	Seed taste[2]	Oil content (%)	Seed nitrogen (%)	Radicle length (mm)
Hnan Dun	92	6	2.5	2	55.5	4.23	12
H:1	43	54	6.8	3	57.1	3.69	8
Yori 77	97	2	7.7	4	54.8	4.04	13
Y1:44	75	22	3.8	7	56.7	4.03	9
PA:45	85	10	7.8	5	56.4	4.14	8
Y5:83	90	6	7.5	6	55.4	4.12	6
PB:64	80	18	7.5	2	54.6	4.10	14
H:11	88	6	3.2	5	53.7	4.38	14
Pachequino	93	3	4.7	4	55.1	3.96	11

1. Seed colour 1 - brownish white 10 = bright white
2. Seed taste 0 = tasteless 10 = bitter

Table 3.12 Seed characteristics of genotypes grown at Western Creek Station

Genotype	Oil content (%)	Seed nitrogen (%)
Hnan Dun	54.9	4.20
H:1	56.2	3.73
Yori 77	-	-
Y1:44	54.2	4.40
PA:45	54.2	3.98
Y5:83	50.2	4.95
PB:64	51.3	4.55
H:11	53.7	4.21
Pachequino	51.3	4.89

Table 3.13 Harvest index at maturity and seed weight/total capsule weight ratio

	Harvest index (%)			Seed/capsule ratio (%)		
Genotype	DD	KT	WC[1]	DD	KT	WC[1]
Hnan Dun	21.5[1]	31.7	24.0	39.3	53.3	41.5
H:1	33.3	31.8	23.8	50.3	50.0	37.3
Yori 77	26.0	26.8	21.7	45.5	48.3	42.0
Y1:44	33.3	37.8	30.8	50.0	55.8	46.5
PA:45	31.0	35.3	31.6	46.5	53.3	46.1
Y5:83	34.3	37.8	23.8	52.0	57.5	40.8
PB:64	30.5	36.8	25.3	46.8	54.0	45.5
H:11	27.0	30.0	24.0	45.3	55.0	44.3
Pachequino	27.5	32.5	30.5	45.8	53.8	47.6
LSD (5%)	4.5	4.3	-	6.3	4.8	-

1. Some low values as some seed lost before sampling.

Table 3.14 Characteristics of sesame genotypes

Genotype	1000 seed weight (g) DD	KT	WC	Lodging (rating)[1] KT	Disease (rating)[2] KT
Hnan Dun	3.14	2.86	2.78	<1	3.00
H:1	3.18	2.88	2.68	<1	2.75
Yori 77	2.80	2.60	2.87	6	2.75
Y1:44	3.30	2.93	-	2	1.50
PA:45	3.37	2.88	2.77	0	1.75
Y5:83	3.40	3.04	2.85	<1	2.00
PB:64	3.18	2.81	2.67	1	1.75
H:11	2.74	2.71	2.44	<1	3.00
Pachequino	2.99	2.88	2.76	<1	2.00

1. Lodging 0 = 0% plants lodged 10 = 100% plants lodged
2. Diseases 1 = minor infection 5 = very severe infection

4. Evaluation of sesame selections in the 1992-93 wet season

Introduction

The development of sesame cultivars suitable for central and southern Queensland and northern New South Wales has been undertaken by Mr D Beech, CSIRO. This program has identified two sesame cultivars which show potential for commercial release. These plus another 17 superior Qld selections were evaluated with the DPI&F selections at Katherine Research Station, Northern Territory.

Materials and Methods

Design, treatments and management

Experimental design was a randomised complete block with 3 replicates of 24 sesame selections. The experiment was sown by hand at Katherine Research Station on the 8 January 1993.

The selections were coded as follows; C14, C34, C35, C37, C38, C62, C86, C91, C92, C113, C115, C129, C136, C141, C142, C151, C294, C339, C392, Hnan Dun (all CSIRO selections) and Y1:44, Y5:83, PB:64 (NT selections) and Yori 77 (NT commercial cultivar).

Plot size was 2 rows x 2.0 m with a row spacing of 32 cm. Plots were sown side by side. Plants were thinned to an intra-row spacing of 10 cm (equivalent to 300 000 plants/ha) at 17 DAS.

Recordings and data collection

During the season phenological data was recorded. This included date of first flower, date of 50% plants flowering and date of physiological maturity (95% capsules yellow).

Plant height, leaf number, leaf area and plant weight were measured on 2 plants from each plot at 55 DAS.

At physiological maturity, 5 representative plants were selected from the end of each plot for yield component analysis. The following were recorded;

a) Plant height
b) Height of lowest capsule
c) Total number of capsules
d) Capsule length (middle third reproductive stem)
e) Capsule width (middle third reproductive stem)
f) Oven dry stem weight
g) Oven dry capsule weight
h) Oven dry seed weight

From this data, harvest index and seed weight/total capsule weight ratio were calculated.

At maturity, plant population and seed yield were recorded by harvesting 2 rows x 1.75 m from of each plot. Samples were threshed and cleaned, sub-samples were set aside of 1000 seed weight, seed colour, seed palatability, seedling vigour, % oil and % N determinations.

Results

Phenology

All the CSIRO selections flowered approximately 6 days earlier than the NT selections. The CSIRO selections were 2-3 days earlier to 50% plants flowering for cv. Hnan Dun, which the earliest maturing sesame cultivar grown in the Northern Territory. The NT selections reached 50% plants flowering 3 days earlier than the current commercial cultivar, Yori 77 (Table 4.1). Physiological maturity was approximately 6 days earlier in the CSIRO selections than the NT selections. The NT selections reached physiological maturity 2-3 days after Yori 77 (88 DAS).

The period of flowering for each selection was approx. 30 days.

Plant height, leaf number, leaf area and plant biomass

50% plants flowering

There was a range in plant development for the various selections. The CSIRO selections were shorter in stature, developed a smaller leaf area and lower biomass than the NT selections. The NT selections were similar to Yori 77. Plant development reflected phenology, there being generally 3 groups; CSIRO selections, NT selections and Yori 77 (Table 4.2). Mean plant height, leaf number, leaf area and plant biomass was 106 cm, 67, 115 cm^2 and 17.3 g.

Plant population

Mean population of the selections at harvest was 298 x 10^3 plants/ha (Table 4.3). There was no significant difference in selection populations. Mean seed yield was 1623 kg/ha (Table 4.3). There was no significant differences in seed yield between sesame selections, though seed yields ranged from 1219 kg/ha to 2431 kg/ha. The trend was for the NT selections to develop larger seed yields than Yori 77 or CSIRO selections.

The lack of statistical differences is attributed to the low number of experimental replications and small plot size which allows substantial sample variance. The trends indicated that the late maturing selections produced the largest yields even though 'seed filling' rainfall in March was negligible. All the NT selections and Hnan dun produced seed yields greater than 1800 kg/ha.

Morphology at harvest

Plant height and height of lowest capsule

The sesame selections ranged in plant height from 92 cm to 132 cm, while capsules were set between 31 cm and 84 cm above the ground. The NT selections were at least 20 cm taller than the CSIRO selections, and set capsules approximately twice as high above the ground (Table 4.4). Yori 77 set its capsules the greatest height above the ground, 84 cm.

Total capsule number

Capsule development for the CSIRO selections ranged between 21 and 45 capsules per plant (Table 4.4). The NT selections developed more capsules at 56 to 68 per plant, while Yori 77 set 55 capsules per plant.

Capsule length and width

The CSIRO selections develop longer capsules of narrower width compared to NT selections (Table 4.4). Mean capsule length and width was 30.8 mm and 5.3 mm for CSIRO selections and 27.4 mm and 6.6 mm for NT selections.

Harvest index and seed weight to total capsule weight

Yori 77 had the lowest harvest index (28.7%) and 2nd lowest seed weight/capsule weight ratio (50.0%), that is all the CSIRO and NT selections were better at partitioning of assimilates between the seed and capsule than Yori 77 (Table 4.4).

1000 Seed weight

All NT and CSIRO selections produced sesame seed larger in size than Yori 77 (Table 4.5). Seed size ranged from 2.73 g to 3.07 g per 1000 seed.

Seed germination at harvest

All the NT selections and C38, C91, C142, C151 and C294 indicated levels of seed dormancy at harvest (Table 4.5). Seed dormancy at harvest is a favourable characteristic to have as it prevents seed from germinating in the capsule in the event of a late storm.

Discussion

The CSIRO selections evaluated at Katherine Research Station were early maturing (similar or earlier than Hnan Dun) short in stature, and branching in habit. They developed long, narrow capsules set close to the ground. The white seed produced was bold (larger in size than Yori 77), palatable and with oil contents greater than 53%.

The suitability of the CSIRO selections to the sesame industry in northern Australia is defined by their maturity. Being early maturing types they are possible alternatives to Hnan Dun. Hnan Dun is currently recommended for regions south of Katherine, or possibly be sown in early February to avoid late rainfall.

The CSIRO selections were not suitable as alternative to Yori 77 or the new NT selections. Five superior CSIRO selections and 4 possible selections for the NT have been identified on 1000 seed weight, harvest index and seed yield as suitable for further evaluation. They are as follows;

Superior selections - C62, C91, C113, C339, C392
Possible selections - C35, C115, C142, C294

Their susceptibility to diseases would require immediate investigation.

Table 4.1 Phenology of sesame selections

Selection	Days after sowing			
	First flower	50% plants flowering	Completion flowering	Physiological maturity
C14	28	32	57	83
C34	30	33	62	84
C35	29	34	60	85
C37	28	32	57	84
C38	29	34	62	84
C62	29	33	57	85
C86	30	34	59	85
C91	31	35	58	84
C92	32	35	61	87
C113	30	35	62	85
C115	29	34	61	85
C129	30	35	60	85
C136	30	34	60	84
C141	28	33	59	85
C142	31	34	56	83
C151	29	32	61	85
C294	30	33	56	85
C339	30	35	59	85
C392	28	34	59	84
CHnan Dun	30	35	60	85
Y5:83	37	41	67	90
PB:64	35	41	70	90
Yori 77	39	44	75	88
Y1:44	35	41	67	91
LSD (5%)	2.9	2.3	6.0	2.8

Table 4.2 Plant height, leaf number, leaf area and plant biomass of sesame selections at 55 DAS.

Selections	**Plant height (cm)**	**Leaf number**	**Leaf area (cm^2)**	**Plant biomass (g)**
C14	102	87	128	17.3
C34	106	76	123	17.9
C35	101	79	126	18.4
C37	103	66	106	15.0
C38	109	76	154	16.0
C62	111	71	95	20.6
C86	105	64	91	17.2
C91	87	54	71	10.6
C92	97	72	106	15.9
C113	110	75	120	17.0
C115	98	53	74	12.8
C129	96	62	86	13.5
C136	97	56	79	13.6
C141	99	70	99	14.8
C142	112	58	104	16.1
C151	100	50	57	11.5
C294	114	56	110	20.3
C339	109	72	117	18.4
C392	106	76	109	17.5
CHnan Dun	107	70	125	17.2
Y5:83	118	50	153	23.5
PB:64	108	47	162	15.9
Yori 77	122	106	213	24.7
Y1:44	122	56	154	23.8
LSD(5%)	16.2	25.7	54.2	7.03

Table 4.3 Sesame populations and seed yields

Selection	Plant population ($x10^3$) (p/ha)	Seed yield (kg/ha)
C14	277	1570
C34	289	1577
C35	253	1219
C37	319	1747
C38	265	1564
C62	277	1645
C86	286	1279
C91	307	1532
C92	327	1501
C113	268	1687
C115	310	1437
C129	298	1584
C136	283	1645
C141	316	1551
C142	316	1388
C151	298	1614
C294	321	1415
C339	274	1369
C392	348	1639
CHnan Dun	298	1882
Y5:83	351	2431
PB:64	283	1859
Yori 77	321	1638
Y1:44	286	2185
Mean	298	1623
LSD (5%)	NS	NS

Table 4.4 Morphology of sesame selections at Katherine

Selection	A	B	C	D	E	F	G
			Character				
C14	99	34	39	31.3	5.4	36.7	53.3
C34	107	36	45	31.3	5.7	37.7	54.3
C35	100	31	33	31.0	5.9	36.0	51.7
C37	98	37	26	28.7	5.6	36.0	54.3
C38	110	49	41	31.8	5.7	34.3	52.3
C62	107	40	34	31.1	6.3	36.0	54.0
C86	95	38	33	30.3	5.5	34.0	50.7
C91	95	28	32	32.3	5.5	38.7	54.7
C92	101	37	34	31.4	5.4	35.3	53.0
C113	113	43	35	30.3	5.6	36.3	55.3
C115	97	40	35	28.7	5.2	39.3	56.3
C129	93	35	36	29.2	5.6	35.7	50.3
C136	92	36	31	32.7	5.0	32.7	49.3
C141	108	36	43	28.9	5.2	34.0	52.0
C142	98	35	29	31.7	5.4	36.7	52.3
C151	105	42	43	32.6	5.6	37.7	55.3
C294	106	43	31	32.4	5.6	35.3	52.7
C339	93	32	26	29.8	5.8	37.7	55.0
C392	110	37	39	29.7	5.7	35.7	52.0
CHnan Dun	105	41	33	29.7	5.5	37.7	52.7
Y5:83	132	65	68	27.8	6.9	39.3	57.3
PB:64	131	76	60	26.9	6.2	35.7	54.7
Yori 77	129	84	55	26.8	6.3	28.7	50.0
Y1:44	126	70	56	27.6	6.8	36.3	55.7
LSD (5%)	19.8	14.4	17.1	3.04	0.69	0.04	NS

A: Plant height (cm)
B: Height of lowest capsule (cm)
C: Total capsule number
D: Capsule length (mm)
E: Capsule width (mm)
F: Harvest index (%)
G: Seed weight/total capsule weight (%)

Table 4.5 Morphology of sesame selections at Katherine

	Character						
Selection	**H**	**I**	**J**	**K**	**L**	**M**	**N**
C14	2.85	3	6.7	57.1	4.11	97	1
C34	2.73	2	6.5	56.7	3.92	99	0
C35	2.92	2	7.0	54.4	4.16	99	1
C37	2.76	3	6.3	57.0	4.12	96	0
C38	2.85	2	3.8	55.4	4.24	81	13
C62	3.00	2	7.0	56.5	4.12	97	1
C86	2.92	2	6.8	55.8	4.16	98	0
C91	2.97	3	4.0	54.8	4.37	84	15
C92	2.96	2	4.2	55.2	4.20	98	0
C113	2.91	2	4.5	55.6	3.99	93	5
C115	2.87	1	3.8	57.6	4.24	89	9
C129	2.74	3	4.0	56.7	4.04	96	0
C136	2.87	1	4.2	55.0	4.24	97	0
C141	2.85	1	4.0	58.7	3.70	98	0
C142	2.96	2	4.7	53.6	4.22	78	19
C151	2.85	4	3.3	56.2	4.17	82	15
C294	2.97	3	1.0	53.9	4.30	86	14
C339	3.07	3	2.2	55.6	4.06	94	5
C392	2.95	4	1.2	56.4	4.26	88	10
CHnan Dun	2.90	4	2.8	55.3	4.29	95	2
Y5:83	2.93	3	5.8	58.6	3.76	7	92
PB:64	2.77	2	6.0	56.3	3.85	18	79
Yori 77	2.73	5	8.0	57.8	3.81	99	0
Y1:44	2.89	4	6.0	57.7	3.84	71	27

H: 1000 Seed weight (g)
I: Taste (0 = tasteless, 10 = bitter)
J: Seed colour (1 = brownish white, 10 = bright white)
K: Seed oil content (%)
L: Seed nitrogen content (%)
M: Fresh germinated (%)
N: Fresh ungerminated (%)

5. Effect of late sowing on sesame development and seed yield.

Introduction

The effect of sowing date on sesame seed yield, was investigated at Douglas Daly Research Farm in 1987-88 wet season. Seed yield was reduced by 32.0 kg/day for sowing dates later than the 12 January but before the 2 February.

This study investigates the effect of delaying sowing on sesame development, seed yield and seed quality for the new sesame genotypes for northern Australia at Katherine, Northern Territory.

Materials and methods

Design, treatments and management

Experimental design was a split plot with 2 sowing dates (main plot), 4 sesame genotypes (sub plot) and 4 replications. Plot size was 3.2 m x 6 rows with 32 cm row spacing.

Dates of sowing were 6 January and 4 February. The genotypes evaluated were Yori 77 , Y1:44, Y5:83 and PB:64.

Plants were thinned to an intra-row spacing of 10 cm (equivalent to 300 000 plants/ha) 19 DAS.

Recordings and data collection

During the season phenological data was recorded. This included date of first flower, 50% plants flowering, completion of flowering, physiological maturity (95% capsules yellow) and harvest maturity (95% capsules brown).

Leaf area, leaf weight, stem weight and capsule weight were measured on 2 plants from each plot at 50% plants flowering, completion of flowering and physiological maturity.

At physiological maturity, 5 plants were selected from the end of the central rows from each plot for yield component analysis.

The following were recorded;

a) Plant height
b) Height of lowest capsule
c) Number of branches
d) Node of lowest capsule
e) Number of capsules on central stem
f) Number of capsules on branches
g) Capsule length (middle third productive stem)
h) Capsule width (middle third reproductive stem)
i) Apex gap of capsule
j) Oven dry stem weight
k) Oven dry capsule weight
l) Oven dry seed weight

From this data, harvest index and seed weight/total capsule weight ratio were calculated. This data was used to assist the evaluation of potential sesame genotypes for northern Australia.

At maturity, plant population and potential seed yield were recorded by harvesting 1.5 m x 4 rows from each plot. Samples were threshed and cleaned, and set aside for 1000 seed weight, germination, oil content determinations.

Two trays (each 1.2 m x 0.25 m) were inserted into the rest of the plot to measure seed shattering losses. Seed collected in these trays was measured every 7 days for 28 days.

Results

Phenology

Results are presented in Table 5.1.

The time to first flower in all TOS2 genotypes was approximately 5 days earlier than for TOS1 genotypes. Yori 77 was last to flower and last to complete flowering for both sowing dates. The flowering period was approximately 8 days shorter for genotypes sown on 4 February.

Leaf area

For TOS1, Yori 77 developed maximum leaf area at 50% plants flowering while the remaining genotypes reached maximum leaf area at completion of flowering. Maximum leaf area was at 50% plants flowering for all genotypes in TOS2 (Table 5.2). Defoliation for all TOS's was complete by physiological maturity.

Plant biomass

Yori 77 increased biomass until physiological maturity in both TOS, while the genotypes generally had a lower biomass at physiological maturity than at completion of flowering. This reduction in biomass was associated with a loss of leaf as the plant matures and the lack of compensating capsule development. This was more evident in the TOS2 (Table 5.3).

Plant population and seed yield

Mean selection population of the genotypes was 286 and 283 x 10^3 plants/ha for TOS1 and TOS2 respectively (Table 5.4). All genotypes for both TOS produced a larger seed yield than Yori 77. Mean seed yield was 1539 kg/ha and 390 kg/ha for TOS1 and TOS2 respectively.

Shattering seed losses

Total seed losses after maturity were highest for Yori 77, being 147.9 kg/ha (Table 5.5). Seed losses for the other genotypes were on average approximately 108 kg/ha. The largest loss of seed occured in the week prior to harvest maturity.

Accumulative seed losses as a percentage of potential seed yield

Total seed losses for Yori 77, as a percentage of potential yield was approximately 3 times that for the other genotypes indicating that they had better retention capability (Table 5.6).

Seed quality

Seed produced by all the sesame genotypes by TOS2 was smaller in size, contained a lower oil content and had fewer fresh ungerminated seed (Table 5.7). Mean seed size, oil content and percentage fresh ungerminated seed was 2.87 g, 56.6% and 18.8% for TOS1 and 2.57 g, 55.1% and 2.7% for TOS2.

Yield components

The new sesame genotypes indicated their superiority above Yori 77 in various yield attributes. The new genotypes developed their capsules closer to the ground to make it easier to harvest their capsules were longer, and the partitioning of assimilates between seed and plant biomass was more efficient (Tables 5.8, 5.9, 5.10 and 5.11).

The superior genotypes tended to have a less branching habit than Yori 77, have a thicker capsule width and have a larger apex gap on the mature capsules (Tables 5.8, 5.9 and 5.10). This larger gap however did not result in higher seed losses (Table 5.5).

Discussion

The development of plant biomass by Yori 77 was different to the other genotypes. As sesame plant commences flowering the change in leaf design from broad to narrow leaves reduces leaf area and leaf biomass for Yori 77. This change in leaf shape did not reduce leaf area or leaf biomass for the other genotypes; leaf area and leaf biomass continued to increase until completion of flowering. The 6 February sowing however reduced this difference. Time of sowing influenced capsule development for the sesame genotypes more than for Yori 77. A February sowing resulted in the genotypes maintaining only the capsule biomass developed by completion of flowering, while Yori 77 was able to continue capsule development. As capsule development was associated with a period of no rain it can be assumed that Yori 77 was able to use more efficiently available soil moisture or extracted moisture to a greater depth with a deeper root system.

All the genotypes were able to produce larger seed yields than Yori 77 regardless of sowing date. Delaying time of sowing reduced mean potential seed yield for all sesame lines estimated at a loss of 39.6 kg/ha/day. However for the higher yielding genotypes this loss in potential seed yield was as high as 52.0 kg/ha/day.

Table 5.1 Effect of time of sowing on phenology of sesame

		Days after sowing				
Genotype	TOS	First flower	50% plants flowering	Completion flowering	Physiological maturity	Harvest maturity
Yori 77	6 Jan	36	46	71	90	103
	4 Feb	31	42	59	75	84
Y1:44	6 Jan	33	42	68	94	104
	4 Feb	30	35	55	74	84
Y5:83	6 Jan	35	42	69	94	105
	4 Feb	29	35	55	73	84
PB:64	6 Jan	35	42	69	92	103
	4 Feb	29	34	54	72	84

TOS - Time of sowing

Table 5.2 Effect of time of sowing on sesame leaf area development

Genotype	TOS	Leaf area per plant (cm^2) 50FL	CFL	PM
Yori 77	6 Jan	93	77	5
	4 Feb	64	34	2
Y1:44	6 Jan	75	99	0
	4 Feb	79	57	1
Y5:83	6 Jan	74	104	0
	4 Feb	53	55	1
PB:64	6 Jan	77	120	0
	4 Feb	47	40	1

50FL - 50% plants flowering
CFL - Completion of flowering
PM - Physiological maturity

Table 5.3 Effect of time of sowing on sesame biomass

		Leaf wt per plant (g)			Stem wt per plant (g)			Capsule wt per plant (g)		Total plant wt (g)		
Genotype	TOS	50FL[1]	CFL[2]	PM[3]	50FL	CFL	PM	CFL	PM	50FL	CFL	PM
Yori 77	6 Jan	3.9	3.7	0.3	3.6	9.4	8.9	10.2	15.0	7.5	23.3	24.3
	4 Feb	3.9	2.0	0.2	2.9	4.3	4.5	2.1	4.4	6.8	8.3	9.1
Y1:44	6 Jan	2.8	4.7	0.0	3.2	7.6	7.1	10.6	16.5	6.0	22.8	23.6
	4 Feb	2.8	2.7	0.1	3.1	5.3	3.5	4.7	4.5	5.9	12.7	8.0
Y5:83	6 Jan	3.0	5.4	0.0	3.1	8.5	6.9	13.4	15.9	6.1	27.3	22.8
	4 Feb	2.0	2.9	0.0	2.0	5.7	2.5	5.3	4.2	4.0	13.9	6.8
PB:64	6 Jan	2.8	7.1	0.0	3.1	9.0	8.2	15.2	17.8	5.9	31.3	26.0
	4 Feb	1.5	2.3	0.0	1.7	4.2	2.3	3.6	3.1	3.2	10.0	5.4

[1] 50% plants flowering
[2] Completion of flowering
[3] Physiological maturity

Table 5.4 Sesame populations and seed yields

Genotype	TOS	Population ($x10^3$) (p/ha)	Seed yield (kg/ha)
Yori 77	6 Jan	273	878
	4 Feb	279	260
Y1:44	6 Jan	310	1975
	4 Feb	297	466
Y5:83	6 Jan	275	1775
	4 Feb	262	452
PB:64	6 Jan	288	1529
	4 Feb	294	381
Mean	6 Jan	286	1539
	4 Feb	283	390

Table 5.5 Effect of sesame genotype seed shattering losses

	Seed losses (kg/ha) for the 7 day period until					
Genotype [1]	92das	99das	106das	113das	120das	Total
Yori 77	18.3	60.4	51.3	13.3	4.6	147.9
Y1:44	7.9	32.5	40.0	17.1	7.1	104.6
Y5:83	5.4	23.3	48.8	21.2	10.8	109.5
PB:64	20.0	30.0	45.8	10.0	4.2	110.0
Mean	12.9	36.6	46.5	15.4	6.7	

[1] 6 Jan plots

Table 5.6 Accumulative seed shattering losses as percentage of potential seed yield.

	Shattering losses as % of seed yield				
Selection[1]	92[2] das	99 das	106[3] das	113 das	120 das
Yori 77	2	9	15	16	17
Y1:44	<1	2	4	5	5
Y5:83	<1	2	4	6	6
PB:64	1	3	6	7	7
Mean (%)	1	4	7	9	9

[1] 6 Jan plots
[2] Physiological maturity (95% capsules yellow)
[3] Harvest maturity (95% capsules brown)

Table 5.7 Effect of time of sowing on seed quality

Genotype	TOS	1000 seed wt (g)	Normal germination (%)	Fresh ungermin (%)	Oil content (%)
Yori	6 Jan	2.77	92.9	5.5	56.2
	4 Feb	2.37	96.4	1.7	54.2
Y1:44	6 Jan	2.83	84.3	14.6	57.1
	4 Feb	2.53	96.3	1.7	55.9
Y5:83	6 Jan	3.03	84.7	13.8	56.6
	4 Feb	2.73	93.1	3.8	54.9
PB:64	6 Jan	2.97	55.1	41.3	56.4
	4 Feb	2.80	94.9	3.7	55.3
Mean	6 Jan	2.90	79.3	18.8	56.6
	4 Feb	2.60	95.2	2.7	55.1

Table 5.8 Effect of time of sowing on sesame yield components

Genotype	TOS	Plant height (cm)	Height lowest capsule (cm)	Number branches	Node lowest capsule
Y1:44	6 Jan	111	59	0.2	6.6
	4 Feb	80	57	0.6	7.0
Yori 77	6 Jan	116	68	1.7	7.8
	4 Feb	86	62	0.6	8.0
Y5:83	6 Jan	115	57	0.3	6.6
	4 Feb	81	50	0.7	6.7
PB:64	6 Jan	109	56	0.1	6.6
	4 Feb	79	48	0.3	6.5

Table 5.9 Effect of time of sowing on sesame yield components

Genotype	TOS	Capsule no. (central stem)	Capsule no. (branches)	Total no. capsules	Capsule length (mm)	Capsule width (mm)
Y1:44	6 Jan	58	2	60	26.0	6.5
	4 Feb	21	4	26	26.4	6.0
Yori 77	6 Jan	43	12	56	24.8	5.9
	4 Feb	17	6	21	23.7	5.2
Y5:83	6 Jan	59	9	68	26.8	6.5
	4 Feb	22	5	25	26.2	6.2
PB:64	6 Jan	43	2	45	26.0	6.4
	4 Feb	19	2	21	26.6	5.9

Table 5.10 Effect of time of sowing on sesame yield components

Genotype	TOS	Apex gap (mm)	Stem wt (g)	Capsule wt (g)	Seed wt (g)	Total plant wt (g)
Y1:44	6 Jan	5.8	33	31	47	111
	4 Feb	4.1	19	18	18	56
Yori 77	6 Jan	4.1	38	32	32	103
	4 Feb	3.0	21	12	9	42
Y5:83	6 Jan	6.0	36	34	47	116
	4 Feb	4.0	19	19	17	55
PB:64	6 Jan	5.9	25	22	29	77
	4 Feb	4.8	17	15	14	46

Total biomass may not equal sum of components due to rounding of values.

Table 5.11 Effect of time of sowing on sesame yield components

Genotype	TOS	Harvest index (%)	Seed/capsule wt ratio (%)
Y1:44	6 Jan	42.3	60.0
	4 Feb	31.5	49.8
Yori 77	6 Jan	31.0	49.5
	4 Feb	20.5	41.7
Y5:83	6 Jan	40.2	58.3
	4 Feb	30.0	45.4
PB:64	6 Jan	38.2	56.5
	4 Feb	29.8	48.3

6. Current purity of commercial Yori 77 seed

Introduction

Sesame is normally self-pollinated, however insect pollination can occur. Up to 10% out crossing has been widely reported by many authors with outcrossing reaching up to 50% in specific cultivars. During the development of the Northern Territory sesame industry there has been outcrossing occurring between the 3 commercial cultivars and at least 2 black seed local landraces. This has resulted in the cultivars having many off types crop making harvesting difficult and giving seed of poor quality.

In 1987-88 wet season a list of plant descriptors was developed for the 3 commercial cultivars and a local landrace of sesame (Bennett, 1991). The restoration of pure Yori 77 seed commenced in 1988-89. After 3 years of seed multiplication and commercial use an estimate of the current level of seed purity was undertaken.

Materials and methods

Design, treatments and management

Two commercial lines of Yori 77 seed were examined. These lines (88-89 and 91-92) were identified by the season in which the seed was produced, for example 88-89 was produced in the 1988-89 wet season.

Both sesame lines were sown in unreplicated observation plots on 3 January 1993. Both plots consisted of 8 rows, 5.0 m long with 32 cm row spacing. Plants were thinned to an intra-row spacing of 10 cm (equivalent to 300 000 plants/ha) at 14 DAS.

Measurements and data collection

During the season dates of various phenological occurrences were recorded. These included dates of first flower, 50% plants flowering, completion of flowering and physiological maturity.

At 53 DAS, 105 plants were sampled from each plot and the presence or absence of the following characteristics were recorded:

a) flower
b) extra-floral nectaries
c) red petioles
d) throat of flower showing "speckling"

At 80 DAS, the percentage of plants lodged was estimated.

At physiological maturity, 104 plants were sampled from each plot and the following measured:

a) plant height
b) number of branches
c) height of lowest capsule
d) node of lowest capsule

Percentage dark seed, 1000 seed weight and germination percentage were determined for seed collected from these plants.

Results

Phenology

Phenology of the 2 lines of Yori 77 was similar (Table 6.1). Both lines reached 50% plants flowering by 50 DAS and physiological maturity by 85 DAS.

Flower morphology

The 88-89 Yori 77 line contained a larger number of plants with nectaries and vegetative plant types as compared to the 91-92 Yori 77 line (Table 6.2). The presence of theses off-types influence Yori 77 susceptibility to lodging. The greater the number of off-types the lower the percentage of plants lodging.

Susceptibility to lodging

The 88-89 Yori 77 line was not as susceptible to lodging as the 91-92 Yori 77 line (Table 6.3).

Seed characteristics

The seed of 88-89 Yori 77 line was smaller in size and contained a higher percentage of dark seed than the 91-92 Yori 77 line (Table 6.4). Both lines of Yori 77 had the same fresh seed germination percentage, ie. 98%.

Plant height

The 91-92 Yori 77 line was slightly taller and showed less variation in plant height than the 88-89 Yori 77 line (Table 6.5 and Figure 6.1). Mean plant height was 121.8 cm and 118.5 cm respectively.

Number of branches

The mean number of branches was 2.1 and 2.3 per plant for the 91-92 and 88-89 Yori 77 lines respectively (Table 6.5). However there were individual plants in the 88-89 line that developed as many as 8 to 12 branches per plant (Figure 6.2).

Height of lowest capsule

The mean height for the lowest capsule was 75.5 cm and 75.2 cm for the 91-92 and 88-89 Yori 77 lines respectively (Table 6.5). While there was a group of plants in the 88-89 Yori 77 line that developed their capsules higher than 113 cm above the ground (Figure 6.3).

Node of lowest capsule

The mean node number for the lowest capsule was 8 for both sesame lines (Table 6.5). Some plants in the 88-89 Yori 77 line however developed their lowest capsules at the higher nodes 11 to 14 (Figure 6.4).

Discussion

Restoration of the pure seed status of sesame cultivar Yori 77 commenced 3 years ago. The current commercial line grown in the Northern Territory is now more uniform in plant height, number of branches, height and node of lowest capsule. The seed produced is larger and contains fewer dark seed types than the seed available in 1989.

The number of plants exhibiting nectaries, red petioles, speckled inner corolla or excessive vegetative plant types has been markedly reduced. The removal of these off-types has resulted in the susceptibility of Yori 77 to lodging being more prominent.

With the development of the new sesame cultivar for northern Australia, further restoration of the purity of Yori 77 will be limited to those occasions when seed stocks are renewed to maintain seed viability. The purity of the new cultivar will also be assessed on a 3 yearly cycle commencing in 1995/96.

Figure 6.1 Comparison of plant height for 2 commercial lines of Yori 77.

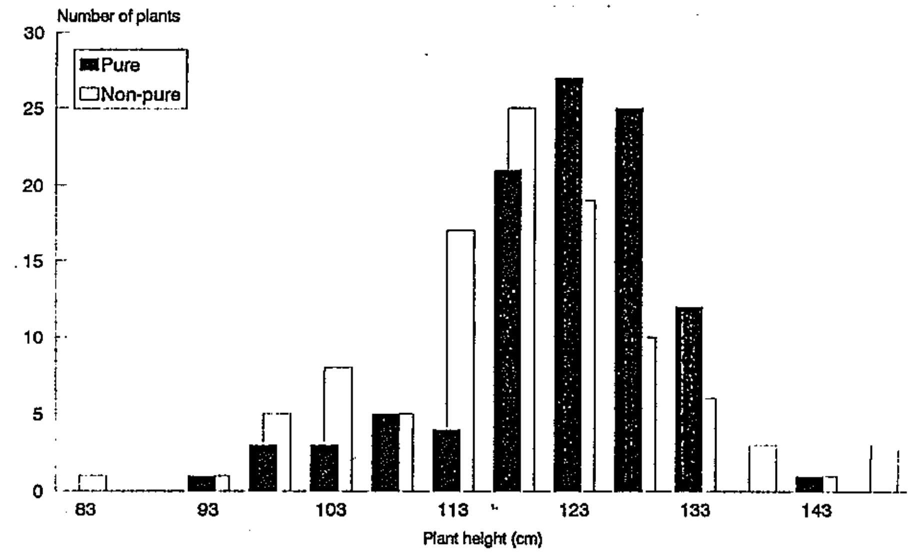


Figure 6.2 Comparison of number of branches for 2 commercial lines of Yori 77.

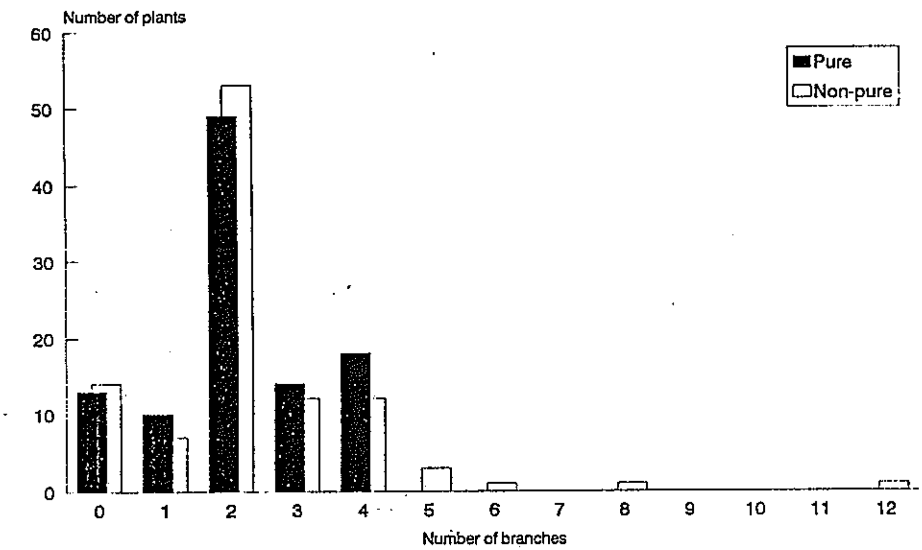


Figure 6.3 Comparison of height of lowest capsule for 2 commercial lines of Yori 77.

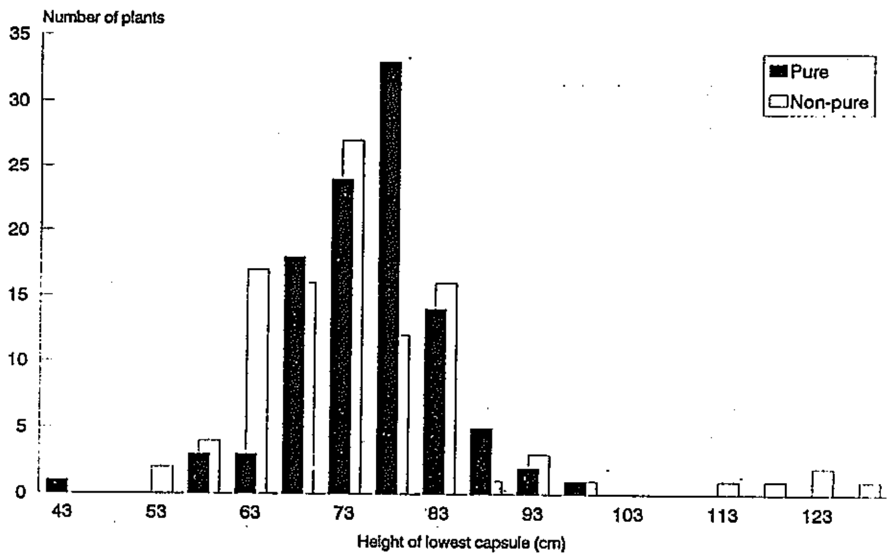


Figure 6.4 Comparison of node number of lowest capsule for 2 commercial lines of Yori 77.

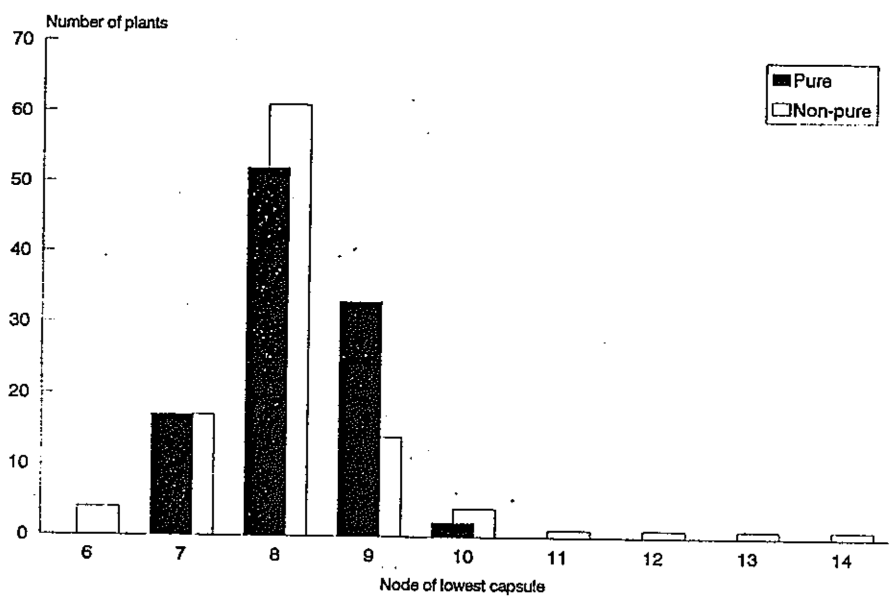


Table 6.1 Phenology of 2 commercial lines of Yori 77

	Days after sowing			
Commercial line	First flower	50% plants flowering	Completion flowering	Physiological maturity
88-89	43	49	75	85
91-92	41	50	74	85

Table 6.2 Comparison of flower morphology of 2 commercial lines of Yori 77 at 53 DAS.

	Number of plants with				
Commercial line	Nectaries (a)	Red petioles (b)	'Speckled' inner corolla (c)	No flowers	Flowers but no a,b&c
88-89	7	4	4	20	72
91-92	2	6	3	1	99

Note: a,b and c are not mutually exclusive.

Table 6.3 Comparison of lodging susceptibility for 2 commercial lines of Yori 77 at 80 DAS.

Commercial line	Plants lodged (%)
88-89	60
91-92	80

Table 6.4 Comparison of seed characteristics for 2 commercial lines of Yori 77

Commercial line	1000 seed wt (g)	Dark seed (%)	Germination (%)	Oil content (%)	N content (%)
88-89	2.90	7	98	55.3	4.08
91-92	3.10	<1	98	56.4	3.88

Table 6.5 Mean plant height, number of branches, height of lowest capsule and node of lowest capsule for the 2 commercial lines of Yori 77.

Commercial line	Plant height (cm)	No branches	Height lowest capsule (cm)	Node lowest capsule
88 - 89	118.5 (11.5)[1]	2.3 (1.7)	75.2 (13.5)	8.2 (1.2)
91 - 92	121.8 (8.8)	2.1 (1.2)	75.5 (7.6)	8.2 (0.7)

[1] standard deviation

7. Effect of time and rate of Reglone application on desiccation of sesame.

Introduction

A major problem in the establishment of a sesame industry in the Northern Territory is that the sesame cultivar Yori 77 is a dehiscent plant type, ie. the capsules dehisce as the crop matures. This results in considerable seed loss prior to and during harvesting.

The use of the chemical, Diquat (Reglone)® as desiccant to reduce pre-harvest losses has been effective for the Queensland sesame industry. Research by Oemcke et al (1992) has indicated that desiccation would be successful in the Northern Territory. This experiment investigates rates and times of Reglone application while monitoring seed quality aspects of the sesame crop.

Materials and Methods

Design, treatments and management

Experimental design was a randomised complete block with a factorial combination of 4 rates at 4 times of application with Reglone (Diquat 200 g/l) using 4 replications. Rates and times of application are presented in Table 7.1.

Plot size was 7 rows x 10.0 m with 32 cm row spacing. Sesame cv. Yori 77 was sown with a small plot combine. Plots were not thinned. Plant population was approximately 380 x 10^3 plants/ha.

Recordings and data collection

The following procedure was implemented as each treatment was applied;

a) 5 representative plants were sampled from the middle 2 rows of the plot.

b) Number and morphological condition of the capsules were recorded. Capsules were divided into 4 categories.

1 - green capsules, closed capsule apex
2 - yellow capsules, closed capsule apex
3 - brown capsules, closed capsule apex
4 - any colour, open capsule apex

Only capsules greater than 15mm in length were considered.

Plants were then partitioned into stem and capsules for moisture content determinations.

Plant samples were taken on the day of desiccation and then at 4, 6 and 11 days after Reglone application. The plots receiving the nil treatment were sampled at harvest maturity and 14 days later.

Due to areas of lodging in the experimental site, seed yield and losses from shattering were not measured. However seed was collected from the trial plots to determine seed quality eg. colour, oil content, 1000 seed weight, germination %, palatability and free fatty acid percentage.

Results

Natural dry-down of sesame plants

Morphological and moisture curves are presented in Figures 7.1 and 7.2 respectively.

Physiological maturity (95% capsules yellow) occurred at 93 DAS. Capsule moisture content at this time was 25%. Capsule moisture continued to decrease to approx. 10% by 100 DAS. At this stage 95% of capsules were brown and open.

Moisture content of the sesame stem was always higher than that of the capsule though they approached equivalent moisture contents at 107 DAS.

It is important to note that this season when the crop reached physiological maturity approximately 80% of capsule were dehiscing. Seed losses were very negligible, but rainfall would have influenced seed quality).

Desiccation at 81 DAS

Morphological and moisture curves are presented in Figures 7.3 and 7.4 respectively.

At this stage 90% of capsules were green and their moisture content was approx. 70%. Six days after spraying there were no green capsules on plants and capsule moisture content was reduced to approx. 14%. Drying for a further 2 days (89 DAS) reduced capsule moisture contents to 10%. The important observation at this time was that though 98% of capsules were brown, only 45% were open.

Desiccation at 86 DAS

Morphological and moisture curves are presented in figures 7.5 and 7.6 respectively.

At this stage 30% of capsules were green and their moisture content was approx. 60%. Four days after spraying there were no green capsules on plants and capsule moisture content being approx. 20%. Drying for a further 3 days (93 DAS) reduced capsule moisture contents to 10%. By now 85% capsules were brown and open and the rest were brown.

Desiccation at 89 DAS

Morphological and moisture curves are presented in Figures 7.7 and 7.8 respectively.

At this stage 18% of capsules were green and their moisture content was approx. 45%. Four days after spraying there were no green capsules and capsule moisture content was approx. 15%. Drying for a further 2 days (95 DAS) reduced capsule moisture contents to 10%. By now 92% capsules were brown and open and the rest were brown.

Seed quality

Early desiccation (81 DAS) resulted in the development of large seed independent of rate of chemical application. Other combinations of rate of chemical application and times of application did not affect seed size. There was no effect of desiccation of germination %, oil content and free fatty acid level (Table 7.2). Mean germination %, oil content and free fatty acid percentage was 97.3%, 54.4% and 0.38%.

Discussion

Examining the natural drying process of a sesame plant indicates that once 10% moisture levels are achieved in the capsules there would be minimal chance of sap contamination from the capsule on the threshed seed. However some sap contamination is still possible from the stem. Allowing the stem to dry to a 10% moisture content would require an additional 7 days. Total 'drying' time is approx. 21-25 days and therefore increase time of exposure causing greater shattering losses in the event of unfavourable climatic conditions such as strong winds and storms during this period.

During harvesting the presence of sap can reduce the quality of the seed by coating the seed testa with an oily film which taints the flavour of sesame products. Farmers currently avoid this situation by allowing the crop to completely defoliate and then harvest after 95% of capsules are brown. This usually results in severe pre-harvesting yield losses associated with seed shattering from the earlier dehisced capsules.

Desiccating the crop enhances the rate of defoliation and drying and improves evenness of maturity. Within 6 days capsule moisture content is approximately 10%, while stem moisture content reaches 10% 5 days later. The total time for crop exposure to shattering losses is 11 days. Harvesting earlier than 11 days increased risk of sap contamination, indicating that the optimum time for harvesting is approximately 10-12 days after desiccation.

The rate of Reglone application did not significantly affect the rate of defoliation of the sesame crop. The experiment will be repeated next year using the new cultivar (Y1:44).

Table 7.1 Rates and times of Reglone application

Rates of application	Time of application
0.0 L/ha	81 DAS (90% green capsules)
1.2 L/ha	86 DAS (30% green capsules)
2.2 L/ha	89 DAS (20% green capsules)
4.5 L/ha	not applied

Table 7.2 Seed quality at harvest

Treatment	1000 Seed wt (g)	Germination (%)	Oil content (%)	Free fatty acid (%)
107 DAS	2.70	97	54.8	0.4
81 DAS 1.2 L/ha	2.87	96	54.1	0.3
81 DAS 2.2 L/ha	2.80	93	55.2	0.4
81 DAS 4.5 L/ha	2.90	98	54.1	0.4
86 DAS 1.2 L/ha	2.73	98	55.1	0.4
86 DAS 2.2 L/ha	2.73	98	53.6	0.3
86 DAS 4.5 L/ha	2.67	98	54.7	0.4
89 DAS 1.2 L/ha	2.70	98	55.4	0.4
89 DAS 2.2 L/ha	2.73	99	54.2	0.4
89 DAS 4.5 L/ha	2.70	98	52.6	0.4

Figure 7.1 Morphological (colour) characteristic of capsules allowed to dry-down naturally

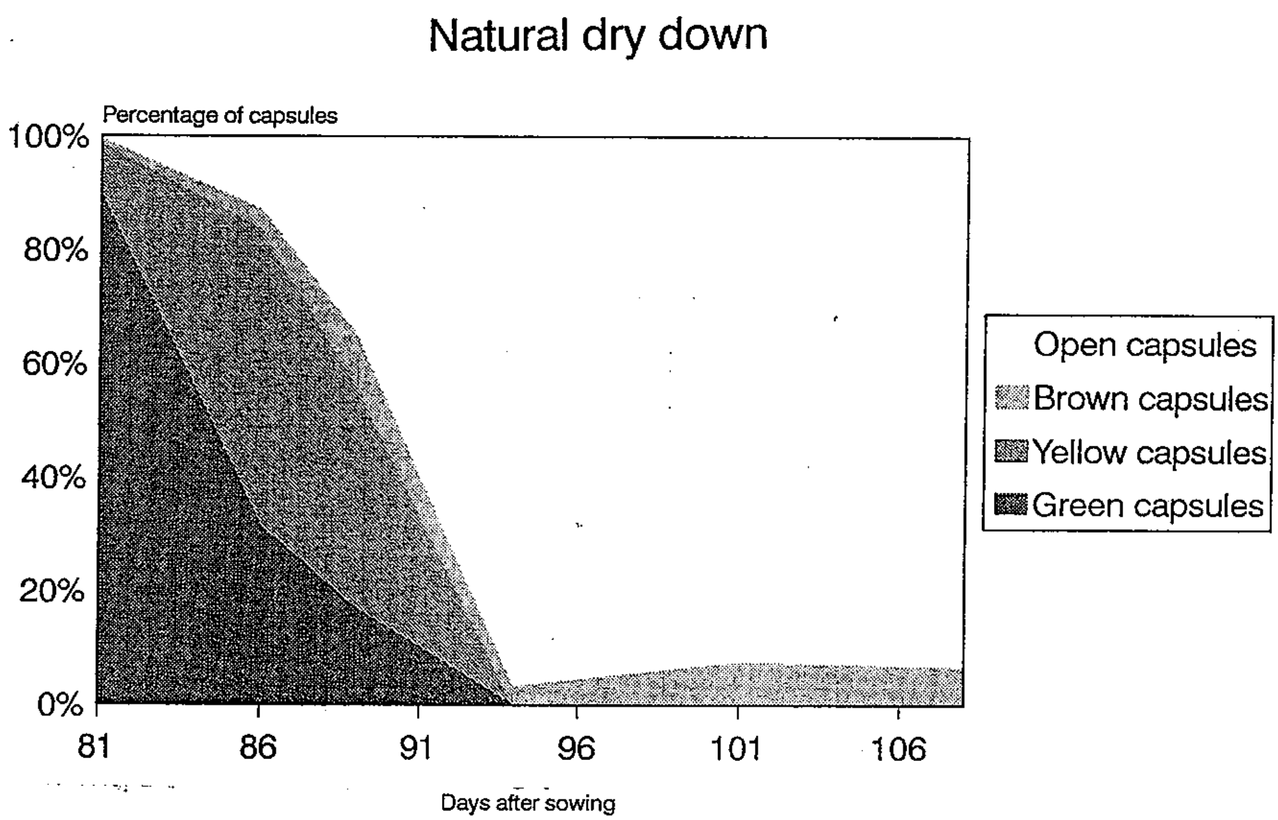


Figure 7.2 Capsule and stem moisture curves for plants allowed to dry-down naturally

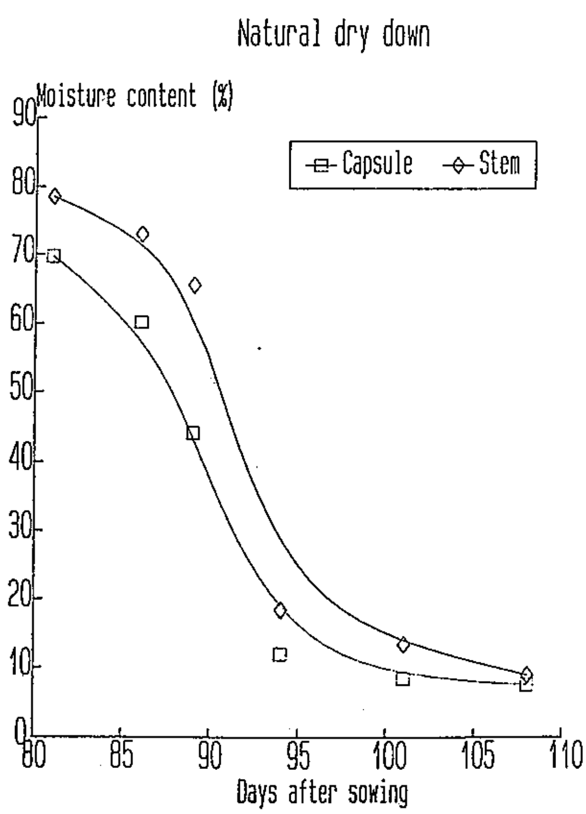


Figure 7.3 Morphological (colour) characteristic of capsules desiccated at 81 DAS

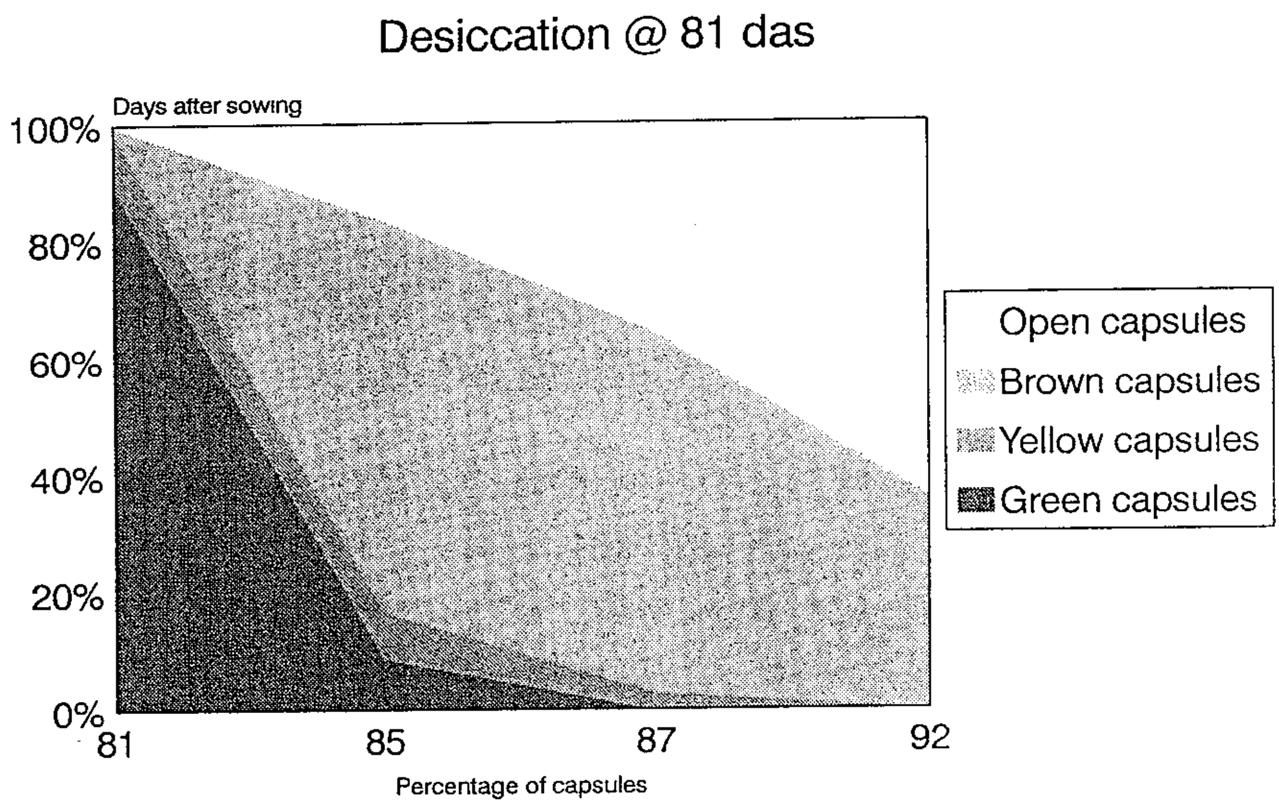


Figure 7.4 Capsule and stem moisture curves for plants desiccated at 81 DAS

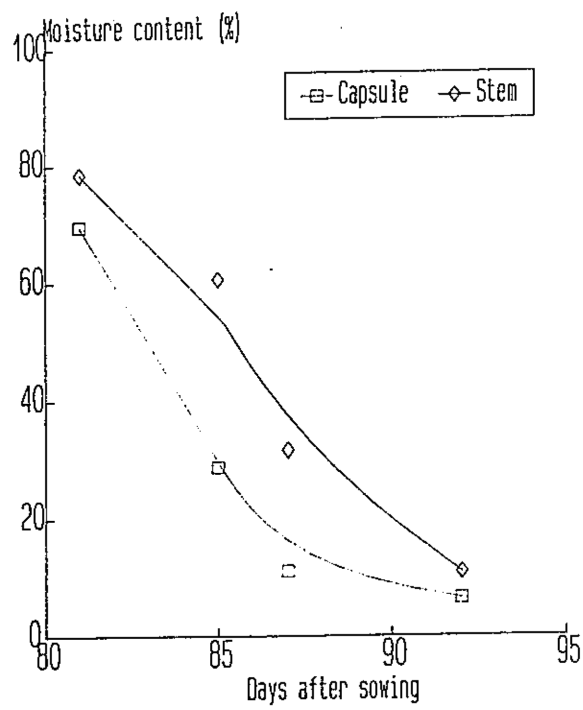


Figure 7.5 Morphological (colour) characteristic of capsules desiccated at 86 DAS

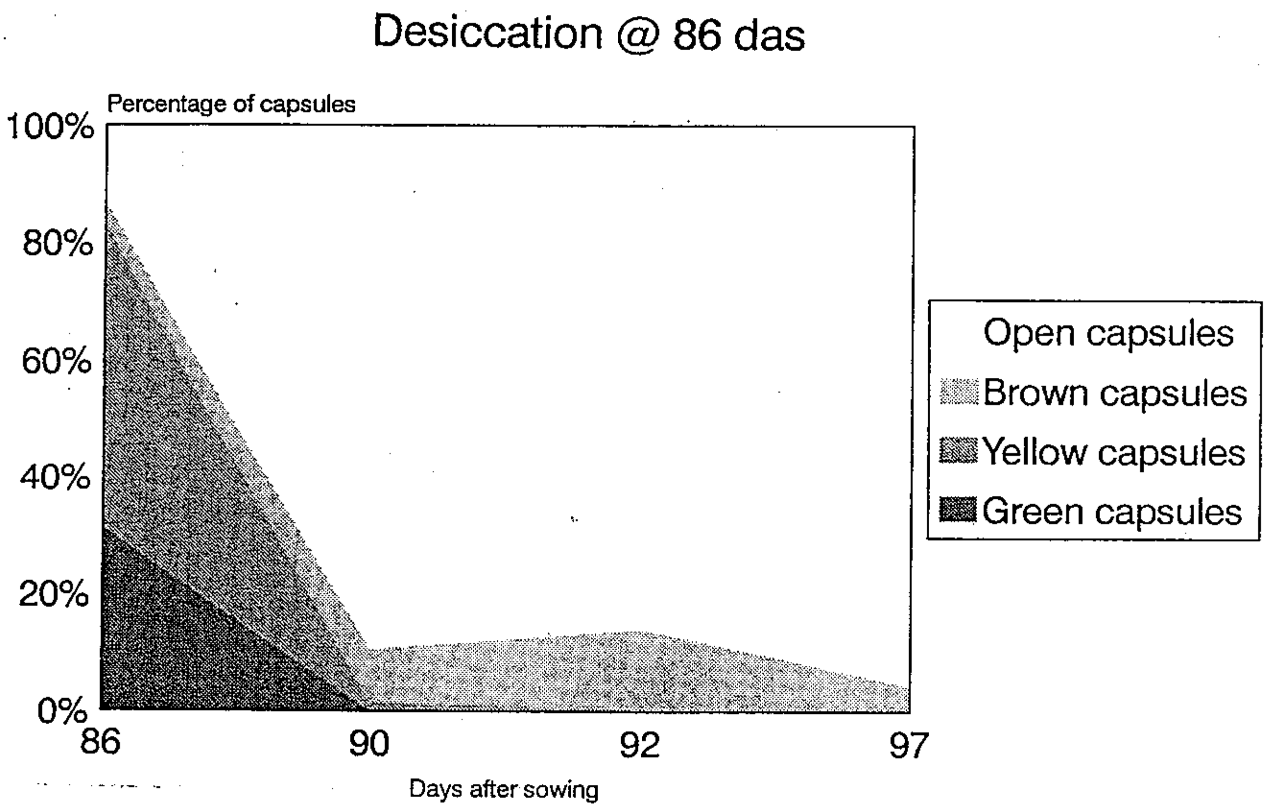


Figure 7.6 Capsule and stem moisture curves for plants desiccated at 86 DAS

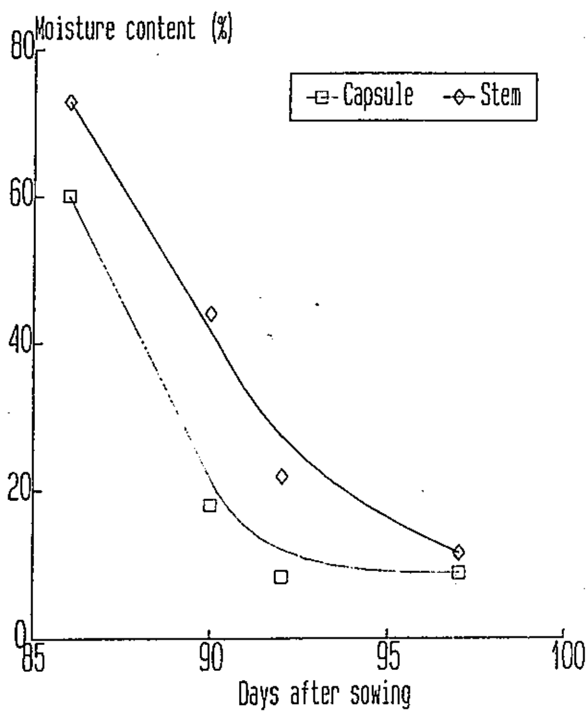


Figure 7.7 Morphological (colour) characteristic of capsules desiccated at 89 DAS

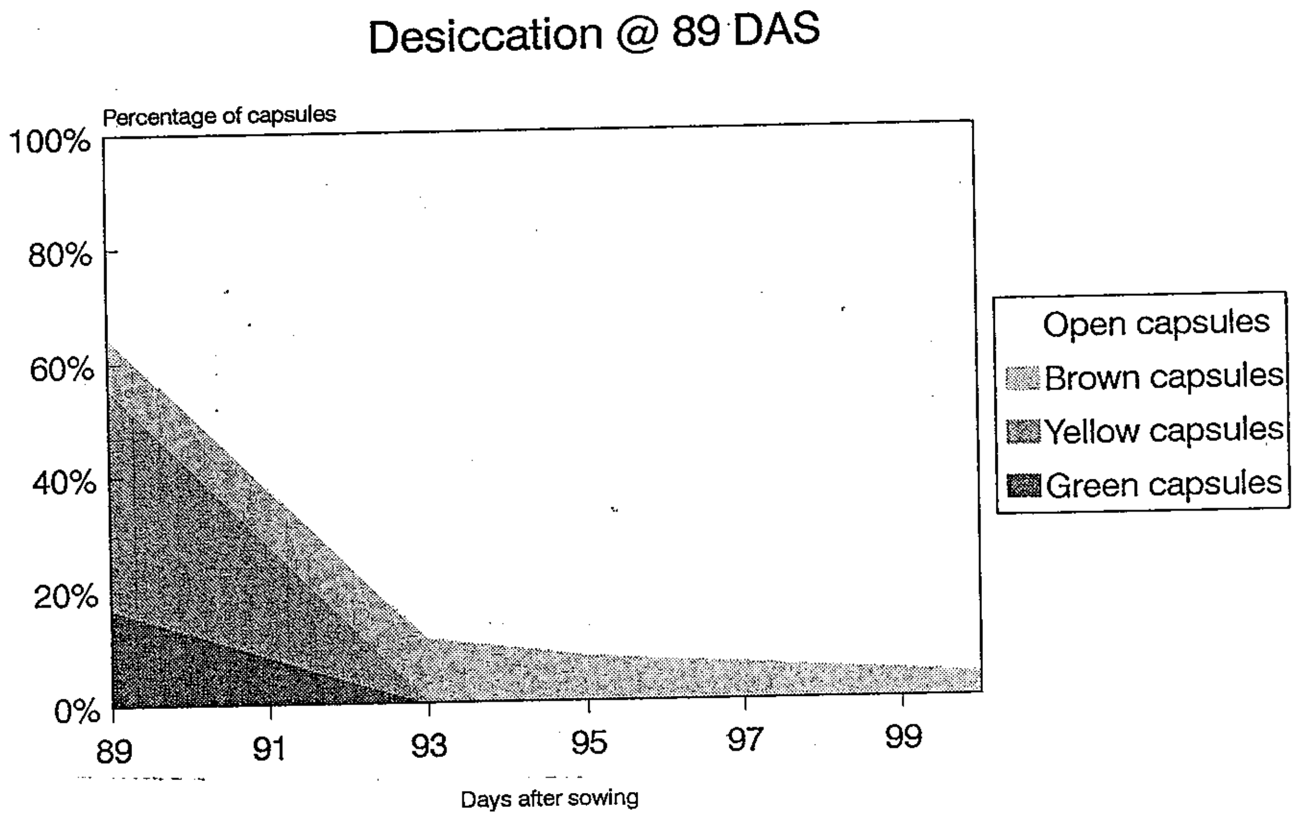
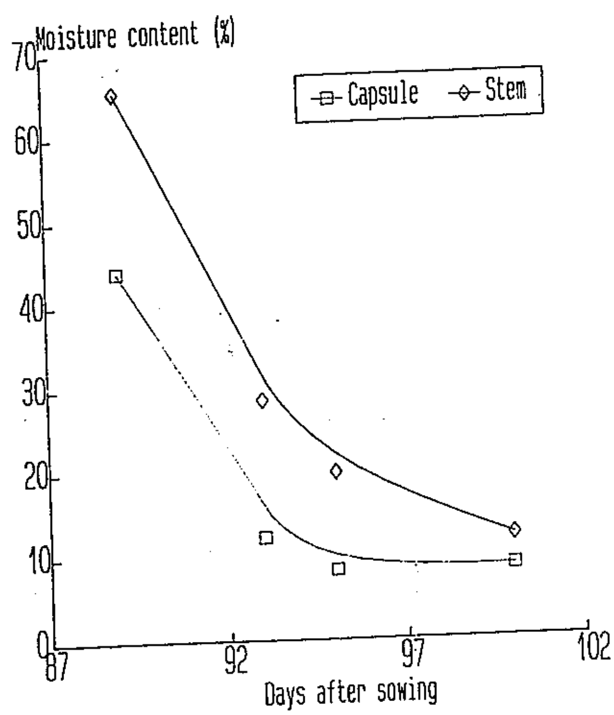


Figure 7.8 Capsule and stem moisture curves for plants desiccated at 89 DAS



8. Effect of soil moisture on the emergence of sesame seedlings.

Introduction

A preliminary experiment was conducted in November at the Katherine Research Station, Northern Territory to investigate whether rate of seedling emergence is correlated with rate of radicle extension.

Local experience has highlighted that the 2 commercial cultivars, Yori 77 and Pachequino, have different times for seedling emergence and establishment. Research has indicated that sesame genotypes have different rates of radicle extension (unpublished data). Yori 77 attains a mean radicle length of 18 mm at 48 hours under alternating temperature conditions of 25- 40°C as compared to a mean of 14 mm for Pachequino.

This experiment was to assess the rate of seedling emergence of Y1:44, Y5:83 and PB:64 seedlings against that of Yori 77 and Pachequino under optimal and sub-optimal soil conditions.

Materials and Methods

Design, treatments and management

Experimental design was a split plot with 2 levels of soil moisture (ie. optimal and sub-optimal) and 5 sesame genotypes with 4 replications. The genotypes were coded as Y1:44, Y5:83, PB:64, Yori 77 and Pachequino.

The site was conventionally prepared with 3 passes of off-set discs and then levelled by a hand-rake. Irrigation (30 mm) was applied 24 hours before sowing. For each replication 5 slots were prepared, 1.2 m long and 30 mm deep. One slot per genotype with 120 seeds per genotype were evenly distributed along the slot and then covered with soil to a depth of 30 mm. Seed characteristics obtained from a controlled environment experiment are presented in Table 8.1.

On completion of sowing the experimental site was sprayed with Lorsban @ 2.0 L/ha to control soil insects. The optimal treatment was hand watered twice a day to maintain a moist soil surface until 3-4 DAS when the experimental site received 35 mm and 6 mm of rainfall respectively. Due to severe surface crusting by 6 DAS the experimental site received an additional 13 mm of irrigation. Environmental data is presented in Table 8.2.

Recordings and data collection

At 24 hour intervals number of emerged seedlings were recorded. This number was converted to a percentage emergence of viable seed sown. (Definition of an emerged seedling was defined as a seedling with its cotolydeons in a horizontal position).

Results

Optimal soil moisture

The emergence of sesame seedlings under moist soil surface conditions is presented in Figure 8.1. The first seedlings to emerge were recorded 3 DAS. Eighty-four percent of Yori 77 seedlings had emerged as compared to 30-31% for Pachequino and PB:64, and 14-18% for Y5:83 and Y1:44. At 4 DAS, 98% of Yori 77 seedlings had emerged compared to 38-44% of seedlings for the other selections. The percentage of Yori 77 seedling to emerge plateaued at this point. At 6 DAS the number of seedlings to emerge for the other selections was 54-61%. Ameliorating the influence of the crusting at 7 DAS allowed another 6% of seedlings to emerge by 10DAS.

Sub-optimal soil moisture

Emergence of sesame seedling under this treatment is presented in Figure 8.2. Percentage of seedlings to emerge by 3 DAS ranged between 3% and 5%. After the rainfall that occurred on the evening of the 3 DAS, the emergence of Yori 77 seedling increased to 37% as compared to the other genotypes with 8% to 17%. Reducing the influence of crusting at 7 DAS allowed approximately another 13% of seedlings to emerge.

Discussion

Under the better soil moisture conditions Yori 77 was quick to emerge. Within 3-4 days all seedlings had emerged. Radicle development for the other genotypes was not as vigorous as Yori 77 and the period for seedling emergence was over a longer period of time, ie. 5-6 days. If crusting was to became a problem after 4 DAS then the new genotypes would find crop establishment difficult. Under the sub-tropical moisture conditions, the sesame genotype did not influence seedling emergence. Ameliorating rainfall at 3 DAS indicated that Yori 77 was more able to take advantage of this condition (4DAS), but overall seedling emergence at 5-6 days was similar for all genotypes.

Table 8.1 Seed viability and rooting characteristics.

Genotype	Germination (%)	Radicle length at 48 hrs (mm)
Yori 77	94.7	18
Y1:44	91.0	13
Y5:83	93.3	12
Pachequino	93.3	14
PB:64	85.4	14

Table 8.2 Environmental data during the seedling emergence experiment.

	Air temperature				
Days after sowing	Max (^0C)	Min (^0C)	Radiation (MJ/m^2)	Rainfall (mm)	Evaporation (mm)
-1	39	28	25	30.0*	9.2
0	39	28	24	0.0	12.4
1	39	28	26	0.0	8.4
2	40	28	28	0.0	8.0
3	41	20	26	35.0	NA
4	36	23	25	6.0	4.8
5	35	24	28	0.0	4.0
6	37	25	28	0.0	5.6
7	38	24	27	13.0*	12.0
8	38	27	27	0.0	9.0
9	38	25	25	0.0	10.6
10	38	26	26	0.0	7.2
Mean	38	26	26	-	8.3

* irrigation
NA data not available

Figure 8.1 Emergence of sesame seedlings under optimal soil moisture conditions

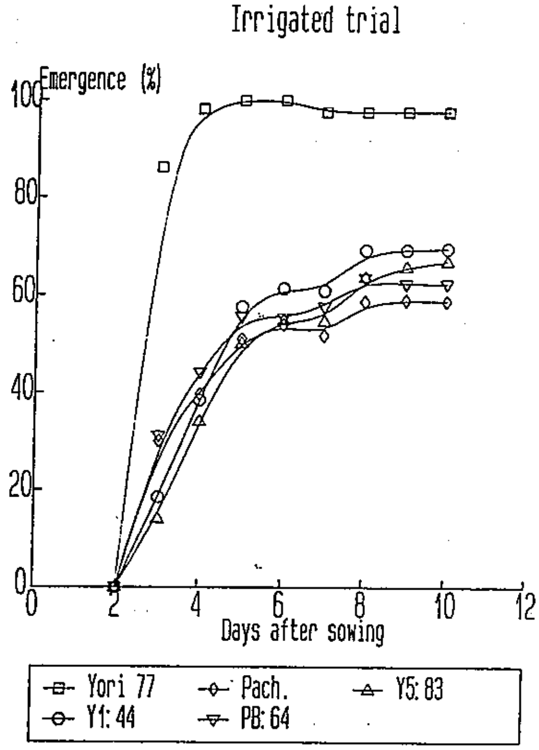


Figure 8.2 Emergence of sesame seedlings under sub-optimal moisture conditions