

period of the restorer line. In the case of the 894 hybrid, however, the apparent dominance of late maturity of the HA 89 line shows up in the hybrid.

Table 3. Comparison of combining ability of several restorer lines.

Restorer line	No. of hybrids	Yield % of 894	Days to Maturity	Oil %
CM 469	55	112	105	48.8
CM 497	22	111	108	49.7
RHA 274	6	91	106	46.6
Hybrid 894		100	111	47.2

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SUNFLOWER VARIETY EVALUATION COONABARABRAN NSW AUSTRALIA.

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ABSTRACT

Eleven variety trials were conducted in the Coonabarabran district (latitude 31°17'S longitude 149°17'E) over four seasons 1977/78 to 1980/81. Thirty seven (37) varieties and hybrids were included and the results demonstrated the superiority of several full season hybrids. Soils ranged from black clay loams to red loams. Annual rainfall ranged from 466 mm to 769 mm whilst summer rainfall (1st Oct to 31st March) was from 251 mm to 363 mm over the period. The table indicates the relative grain and oil yields of the common and new more interesting varieties. Suncross 52 is the standard; 100 = 1360 kgs/ha grain yield (9% moisture), 43.73% oil seed content (9% moisture) and 596 kgs/ha oil yield.

Variety	No. of yrs	Grain Yield	Oil%	Oil Yield/ha
Hybrid Suncross 52	4	100	100	100
Hybrid Hysun 31	4	98	95	93
Hybrid Sunking	3	97	95	92
Hybrid Hysun 30	4	93	96	89
Hybrid Dekalb 500	2	93	93	87
VNIIMK 6540	4	89	94	83
Hybrid Sunbred 707	2	86	94	81
Hybrid Sungold	4	88	91	80
Hybrid Cargill 205	2	82	98	80
Hybrid Lady	2	85	91	77

VNIIMK has been the best of the open pollinated lines. Quick maturing lines were usually poor performers.

INTRODUCTION

Over thirty hybrid and open pollinated sunflower varieties are marketed in New South Wales, Australia. The area sown has ranged from 38 000 hectares to 70 000 hectares (Colton, 1981) in the past five year, yet little effort has been made to regularly and accurately assess varieties on their suitability in terms of yield and oil content. Data from other states and from overseas indicates that large differences exist between varieties (Anon, 1974, 1977, 1980), sometimes in the order of 50% or more. It was therefore believed important to assess a range of both hybrid and open pollinated varieties currently recommended in the state.

The Coonabarabran district (latitude 31°17' south, longitude 149°17' east) where the experiments reported in this paper were carried out is typical in many respects of the main New South Wales sunflower growing areas. It adjoins the Gunnedah Quirindi district and they collectively produce about half of the New South Wales crop (Colton, 1981). The areas are climatically similar and there is little variation in soil type. Most other important sunflower areas in New South Wales are further north and north east of this region and they are hotter (average 2 degrees to 5 degrees Celsius daily average mean) during the growing period.

Table 1. The average rainfall and temperatures (based on 84 years records) for the Coonabarabran district.

Month	Average Rainfall mm	Mean Maximum Temperatures Degrees Celsius	Mean Maximum Temperatures Degrees Celsius
January	74	32.2	14.5
February	82	31.2	14.0
March	62	28.6	11.4
April	55	24.0	6.8
May	50	19.5	2.7
June	59	15.5	1.6
July	52	14.7	- 0.5
August	51	16.9	0.5
September	46	20.6	3.1
October	54	24.7	6.7
November	56	28.4	10.3
December	61	30.8	12.9
Annual Mean	702		

It is considered that the results from the Coonabarabran programme would be more applicable to New South Wales growers than results from any other state, hence the need for the variety evaluation programme. Climatically the high plains of West Texas would be more similar to the main sunflower areas of New South Wales than those in Queensland.

MATERIALS AND METHODS

Five varieties were included in all trials as the standard. These were the hybrids Suncross 52, Hysun 31, Hysun 30 and Sungold, and the open pollinated variety VNIIMK 6540. In all, 37 varieties were assessed in the 4 years. All have been compared on a percentage basis to the 5 standard lines (Table 2 and 3).

There were 11 experiments. Each experiment was a randomised block design with three replicates. In the first two years of assessment trials were sown with a cone seeder mounted on a combine. In the last two years the trials were sown with a Covington planter with Covington press wheels trailing. Plot size was 30 m x 2 m — row spacing varied from 30 cm to 75 cm. The plots were harvested with a 2 m wide auto header. Seed weights were corrected for purity and moisture variation.

The experiments were sown on both the red and black basalt soils of the district on fallows of 5 to 10 month duration and in all cases in conditions that could be described as

excellent for sunflower production (i.e. good weed control etc). Plant populations of 37 000 per hectare were aimed at in all experiments.

Seasonal Conditions.

Climatic details of the area where the experiments were conducted are given in Table 1. Seasonal conditions varied from year to year. The 1980/81 season was one of the hottest on record with mean maximum temperatures 3 to 5 degrees Celsius above average. Rainfall was 30% below the mean. The 1978/79 and 1979/80 seasons were also of below average rainfall while in the 1977/78 season rainfall was about average.

RESULTS

The coefficients of variation of the eleven experiments ranged from 5.3% to 20.1% with 12.8% being the average. This is considered good for sunflower variety experiments in Australia.

The oil percent and oil yield per hectare (9% moisture) for the different sunflower varieties evaluated over the 4 years is shown in Table 2. This table demonstrates the consistent superiority of several full season hybrids, the indifferent performance of open pollinated varieties and the generally inferior performance of all quick maturing varieties. The results are further evidence of the wide variation in the parameters measured that exist in sunflower varieties and demonstrates the need for continuing regional variety assessment.

Table 2. The oil percentage and oil yield per hectare on a 9% moisture basis of the sunflower varieties evaluated over four years.

Variety	Year 77/78		Year 78/79		Year 79/80		Year 80/81	
	% oil	kg oil/ha	% oil	kg oil/ha	% oil	kg oil/ha	% oil	kg oil/ha
Suncross 52	43.0	743	45.4	582	41.7	265	44.72	785
Hysun 31	39.8	563	42.9	634	40.2	233	43.28	784
Hysun 30	40.6	678	42.8	460	39.7	233	44.2	749
VNIIMK 6540	40.3	539	42.2	642	39.4	215	42.54	588
Sungold	38.9	535	40.9	562	37.4	200	41.04	605
Sunking			42.1	538	40.0	242	42.92	738
Sunace	41.3	458	40.6	458	35.6	236		
Macquarie			42.2	383	39.0	205	45.57	499
90A	38.0	393	43.7	509	40.6	145		
Dekalb 500			42.4	572			41.88	624
Sunfola 68 — 2	40.0	481	42.6	612				
Sunbred 707					38.9	215	42.61	645
Cargill 205					39.6	233	45.50	611
Lady					38.2	211	40.62	602
Eureka			46.5	448	41.3	205		
Isanka	39.0	439	42.7	541				
Hysun 21	37.2	404	41.4	480				
Hysun 10	37.2	393	41.0	458				
Suncross 51	41.3	662			38.4	236		
Phillip			41.8	398	39.9	213		
Rockett			42.7	349	39.3	163		
Hysun 11					35.8	154		
Pacific 308							40.53	894
Hysun 32							45.38	732
Suncross 150					37.7	190		

Table 2 continued.

Variety	Year 77/78		Year 78/79		Year 79/80		Year 80/81	
	% oil	kg oil/ha	% oil	kg oil/ha	% oil	kg oil/ha	% oil	kg oil/ha
Flora							42.82	694
Pacific 302							41.29	687
Sunbred 727					38.5	200		
SF5099			43.7	627				
Sunfola 68 — 3			43.5	574				
Pehuen			37.5	488				
Rust Resistant								
Peredovik			40.7	360				
HB400			41.2	349				
Stepniak	38.1	519						
Coefficient of variance		11.2%		4.90%		14.6%		5.3%

Table 3. summarises the grain yield oil percentage of the seed and oil yield per hectare results (9% moisture). The figures are expressed as a percentage of Suncross 52. The results for a particular variety represents its mean over all trials in the number of years it was tested. Hence the grain yield of Pacific 308 was 23% better than that of Suncross 52 in the year of evaluation, whilst the grain yield of Hysun 31 was on average 2% lower than that of Suncross 52 for the 4 years of evaluation.

Table 3. Overall mean grain yield, oil content of the seed and oil yield per hectare (9% moisture) expressed as a percent of Suncross 52.

Variety	Tested No. Years	Grain Yield	Oil %	Oil Yield/ Hectare
Suncross 52	4	100	100	100
Hysun 31	4	98	95	93
Hysun 30	4	93	96	89
VNIIMK 6540	4	89	94	83
Sungold	4	88	91	80
Sunking	3	97	95	92
Sunace	3	80	90	72
Megsun 90A	3	70	94	66
Macquarie	3	65	97	65
Suncross 51	2	96	94	90
Dekalb 500	2	93	93	87
Sunfola 68 — 2	2	88	93	82
Sunbred 707	2	86	94	81
Cargill 205	2	82	98	80
Lady	2	85	91	77
Eureka	2	76	101	77
Isanka	2	80	92	74
Phillip	2	76	94	71
Hysun 21	2	75	89	67
Hysun 10	2	73	88	64
Rockett	2	65	94	61
Pacific 308	1	123	91	112
Hysun 32	1	91	101	92
Suncross 150	1	79	90	72
Hysun 11	1	68	86	58
Flora	1	91	96	88
Pacific 302	1	94	92	88
Sunbred 727	1	82	92	75
SF5099	1	112	96	108
Sunfola 68 — 3	1	103	96	99
Pehuen	1	101	83	84
Rust Resistant				
Peredovik	1	69	90	62
HB 400	1	66	91	60
Stepniak 1686	1	79	88	70
Coefficient of variation			12.8%	

Note: Oil percent 100 = 43.23 (9% moisture)

Oil yield/ha 100 = 596 kgs/ha (9% moisture)

Confidence in the results increases with the number of years a variety was tested. The results highlight the differences between varieties in both grain yield and oil content and the superiority of a limited number of the commercially available lines.

These results indicate large differences between varieties — of the order of 50% difference in extreme cases. Despite large seasonal effects differences in varieties were consistent. This is true especially for oil content but also for yield per hectare.

A group of full season hybrids including Suncross 52, Hysun 31 and Sunking have consistently yielded best, but Suncross 52 has shown almost consistent superiority amongst this group. It has always been highest in oil content and amongst the top performers in all trials. Other full season hybrids have yielded indifferently although the new line Hysun 32 shows promise as does the unnamed experimental Pacific 308.

The open pollinated varieties have yielded relatively poorly with the best lines VNIIMK 6540 and Sunfola 68 — 2 being 17% to 20% inferior to Suncross 52.

The early maturing hybrids and open pollinated varieties have been particularly disappointing, generally in the order of 20% to 50% inferior to Suncross 52.

DISCUSSION

These results indicate farmers need to be careful when choosing varieties, especially when it is considered some 30 different lines are marketed in New South Wales. Several of the hybrids and open pollinated lines sold and promoted commercially have proven particularly disappointing and uneconomical to grow in this region.

These results are hardly surprising considering that generally in New South Wales little thorough testing has been carried out. The difference between the leading hybrids versus the leading open pollinated varieties has been shown to be similar to results in Queensland and North America (Anon, 1974, 1980 [a and b]; Paul and Foreman, 1980; Rosser, personal communication; Walsh, 1980). However it is difficult to explain the difference between varieties in a common maturity group.

Obviously a 20% yield difference between one full season hybrid and another must be a reflection of genetic potential. It is worthy of note that the leading varieties have been bred and selected in Australia whereas several indifferently performing full season hybrids are essentially imported strains with little selection under New South Wales conditions. Suncross 52 for example was selected in New South Wales in an environment similar to that of the Coonabarabran and surrounding sunflower growing region. The explanation as to indifferent performance of open pollinated varieties in these experiments cannot be attributed to disease such as red rust. Apparently the leading hybrids have superior genetic yield and growth features.

The explanation for superiority of full season hybrids versus mid and fast maturing hybrids and open pollinated varieties is also probably partly genetic and seasonal. Despite dry summers, the best of the full season hybrids have been able to last long enough and capitalise on rain when it does eventually arrive, whereas the faster varieties have not. Results from North American trials (Paul and Foreman, 1980; Anon, 1980[a]) suggest a similar trend but in contrast Central Queensland trials suggest a bias to mid season hybrids.

Sunflowers have not reached their potential in New south Wales. Care is needed in varietal choice and considerable scope exists for improvement through breeding and selection.

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LITERATURE CITED

ANON, 1974. Off Station Sunflower Trials. *The National Sunflower Grower February 1974, Volume 1, No. 1*, 8.

ANON, Feb. 1975. Hybrid Sunflowers Perform Well in W.S.D.A. Tests. *The National Sunflower Grower January 1975, Volume 1, No. 12*, 7.

ANON, Feb. 1980(a). 1979. National Performance Trial

Data. *Sunflower Magazine February 1980 Sunflower Association of America*, 45 — 47.

ANON. 1980(b). Sunflower Trial Results Queensland up to 1979 — 80. *Queensland Graingrower, 27th August, 1980*, 16.

COLTON, R. 1981. Fibre and Oil Crop Production. *Summary New South Wales Department of Agriculture Publication*. 1 — 3.

PAUL, W. & FOREMAN J.W. 1980. Sunflower Varieties Central Queensland. *Queensland Graingrower 24th December, 1980*, 14.

WALSH, S.R. 1980. Sunflower Varieties 1980 — 81 Season. *Queensland Agricultural Journal* 106, No. 6, 518 — 520.

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EVALUATION OF SUNFLOWER HYBRIDS IN INTERNATIONAL TRIAL PLANTINGS.

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ABSTRACT

A large number of single and three-way sunflower hybrids, representing the most recent achievements of sunflower breeders from all over the world, were tested in 45 locations from 35 European and non-European countries, during the 1976 — 1981 period. The experimentation was performed within the F.A.O. Research Network on Sunflower co-ordinated by the Research Institute for Cereals and Industrial Crops of Fundulea, Romania. This review paper points out the best performances regarding seed and oil yield, disease resistance and adaptability, under the most different environmental conditions.

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PLANT BREEDER'S RIGHTS AND VARIETIES REGISTRATION IN FRANCE.

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ABSTRACT

Sunflower cultivars, like most agricultural crops, are subjected to two independent French laws:

- one to protect breeder's rights entered into force in 1971 in application of the "Paris convention of 1961", is worked out in accordance with U.P.O.V. (Union internationale pour la Protection des Obtentions Vegetales) principles.
- the other to protect seed consumers, has existed for a longer time and is now applied in conformity with E.E.C. (European Economic Community) rules for cultivars registration and catalogue.

Both require preliminary examination of plant material delivered by applicants and this paper intends to explain administrative and technical procedures used.

INTRODUCTION

The breeder who wants to introduce a new cultivar on the French market has beforehand to make this cultivar registered on the French or on the E.E.C. catalogues. To be registered on the E.E.C. catalogue a cultivar has first to be registered in one of the national catalogues of the E.E.C. members countries; a cultivar newly introduced on one of the E.E.C. members countries catalogue has to wait between three months and two years before reaching the E.E.C. catalogue and the other member countries may use this delay to make a circumstantial opposition against the admission of the variety for his own market. A variety duly registered can be marketed without danger, or even with interest for the users, in each country which don't oppose it and, from the legal point of view, registration means authorization of selling but