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EFFECTS OF PLANTING PERIOD ON SUNFLOWER PRODUCTIVITY IN NORTHWEST KANSAS

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Summary

Available soil water can limit sunflower productivity by direct effects on canopy function, as well as indirect effects on canopy and seed development. The objective of this study was to determine effects of planting period on oilseed and confection sunflower development, seed yield and quality, and water use in rain-fed, semi-arid cropping systems. Planting periods ranged from early May to mid-June. The highest yields for both oilseed and confection crops resulted from the early- or mid-June planting period in both years. Relative yield losses occurred in both years for both oilseed and confection crops planted in the early-May period. These results confirm earlier recommendations to plant sunflower in June when moisture is adequate for rapid emergence and improved crop productivity.

Introduction

Sunflower yield can be reduced by pest infestation, heat stress, and/or water deficits. Optimal planting periods avoid or minimize the impacts of these environmental stress factors on yield. Knowledge of these effects can guide management decisions to sustain or improve water management for sunflower productivity in rain-fed and limited-irrigation crop systems. The objective of this study was to determine effects of planting period on oilseed and confection sunflower development, seed yield and quality, and water use in semi-arid cropping systems.

Procedures

Sunflower seed (SF 187, oilseed at 18,000 seeds/a and Sigco 954, confection at 14,000 seeds/a) was planted (30-inch rows, using a fluted coulter and double-disk opener) in four planting periods beginning early May through mid-June, into a Keith silt loam soil, fallowed after the previous crop. Soil fertility was amended with 90 lb N/a and 30 lb P_2O_5/a. Weeds were controlled by herbicide (Glyphosate, or Roundup, 8 oz/a; sulfentrazone, or Spartan, 3 oz/a and pendimethalin, or Prowl, 3 oz/a). No insecticide was applied for stem or head pests.

Sunflower crop development (leaf appearance and reproductive growth stage) was noted at weekly intervals. Canopy leaf area was measured at flowering (R5) using a Li-Cor 2000 canopy analyzer. Soil water was measured at emergence, flowering, and maturity. Crop stand (V8 and R9), yield components, and above-ground biomass were measured at physiological maturity from two 17 ft by 5 inch rows from each of four replicated plots. Plots were also machine-harvested when seed moisture was less than 12%. Seed was analyzed for moisture content, test weight, seed weight, and oil content (oilseed) or seed size distribution (confection).

Results

Below-normal precipitation and above-normal evaporative demand reduced yield potential of rain-fed sunflower by 24% in 2000, relative to 2001.[1] A heavy infestation of sunflower moth reduced yield potential of the irrigated crop by 24% in 2001, relative to 2000[1], despite insecticide application. Seed quality in this study was poorer in 2001 relative to 2000. Oilseeds tended to lower oil content (Table 5) and confections tended to smaller seed size (Table 6) in 2001 relative to 2000. Weather and insect pests likely affected yield response to planting periods in the two years.

The highest yields for both oilseed and confection crops resulted from the early- or mid-June planting period in both years. Relative yield losses occurred in both years for both oilseed and confection crops planted in the early-May period.

Fewer seeds were harvested per plant for the early planting period relative to later periods. Delayed emergence and low plant populations occurred each year, affecting both crop types. However, yield compensation occurred with more harvested seeds per plant and larger seed size.

These results confirm earlier recommendations[2] to plant sunflower in June when moisture is adequate for rapid emergence and improved crop productivity.

Table 5. Planting period effects on oilseed yield, components, Colby, KS.

Planting Period	Stand	Harvested Seeds/plant	1000 Seed wt	Yield[1]	Oil	Biomass	Planting Date
	plants/a			lb/a	%	lbs/a	
			2000				
1	12,500	445	69.6	838	35.5	na[2]	5/5/00
2	7,875	1,554	62.6	1,665	34.4	4,507	5/19/00
3	10,625	1,729	53.4	1,945	34.9	4,584	6/2/00
4	12,250	1,370	48.7	1,701	35.3	4,312	6/16/00
			2001				
1	12,875	344	33.5	327[3]	31.0	2,179	5/11/01
2	13,500	701	40.8	854	30.9	3,134	5/24/01
3	14,375	814	37.4	970	33.2	3,293	6/8/01
4	6,875	1134	72.6	1,253	32.7	3,874	6/22/01

[1]Yield is adjusted to 10% moisture content.
[2]Not available.
[3]Machine-harvested yield reported for this plot due to nonrepresentative hand-harvest sample.

Table 6. Planting period effects on confection seed yield and size, Colby, KS.

Planting Period	Stand	Harvested Seeds/plant	1000 Seed wt	Yield[1]	<20/64	20-22/62	>22/64	Biomass
	plants/a			lb/a				lbs/a
				2000				
1	9,125	293	96.1	567	28.3	34.2	37.5	na[2]
2	5,750	788	118.9	1,187	9.7	33.4	56.9	na
3	7,000	830	108.6	1,392	20.0	27.6	52.5	na
4	10,125	524	97.3	1,139	20.9	29.1	50.0	na
				2001				
1	8,875	147	91.4	264	88.5	9.9	1.7	2,439
2	11,875	338	84.2	749	65.5	26.5	8.0	3,224
3	11,375	325	83.2	681	68.9	24.3	6.8	3,379
4	5,750	803	107.3	1,097	36.3	28.1	36.3	3,125

[1]Yield is adjusted to 10% moisture content.
[2]Not available.

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[1]Kansas Performance Tests with Sunflower Hybrids, Report of Progress 888, 2001.
[2]H. D. Sunderman, D. W. Sweeney, and J. R. Lawless. 1997. Irrigated Sunflower Response to Planting Date in the Central High Plains. J. Prod. Agric. 10:607-612.

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