

Herbaceous Wind Barriers for Irrigated Lands in Arizona

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Abstract

*Herbaceous wind barriers are tall grasses or other non-woody plants established in narrow strips spaced across the field perpendicular to the prevailing wind direction. They are used on cropland to protect soils and crops from damaging effects of wind and wind-borne soil particles. They should also provide food and cover for wildlife. In Arizona, there is a need to identify herbaceous plants, commonly used for crops, which are effective in controlling soil erosion caused by wind on cropland. This trial was conducted at the Tucson Plant Materials Center and is composed of three hybrid grain sorghum (*Sorghum bicolor* (L.) Moench ssp. *bicolor*) types ('SG-677', 'DS9300', and 'KS-735'), one forage sorghum ('NK300'), one silage corn (*Zea mays* L.) type ('N91-19'), and two grain corn types ('Mexican June' & 'DX-93'). All sorghum types had good height, excellent retention of upright foliage, and excellent second year sprouting. It is apparent that sorghum can be a multi-year herbaceous wind barrier and when established will require minimal amounts of irrigation water to keep it growing and functioning as a multi-year herbaceous wind barrier. The two best performers for the sorghum varieties are 'KS-735' and 'SG-677'. This information can be applied to the conservation practices such as Herbaceous Wind Barrier (603) and Cross-Wind Trap Strips (589C).*

Introduction

Herbaceous wind barriers are tall grasses or other non-woody plants established in narrow strips spaced across the field perpendicular to the prevailing wind direction. They are used on cropland to protect soils and crops from damaging effects of wind and wind-borne soil particles, and should provide food and cover for wildlife. In Arizona, there is a need to identify herbaceous plants, commonly used for crops, which are effective in controlling soil erosion caused by wind on cropland. These herbaceous plants need to fit the following requirements:

1. be readily available on the commercial market
2. can be planted using typical farm equipment
3. require a minimum amount of water or similar water requirements as the crop being grown
4. have an erect form (3-4 plus feet) with dense foliage, be resistant to lodging in the spring months of February through April
5. have few seedling volunteer problems.

Materials and Methods

Conducted at the Tucson Plant Materials Center, this trials composed of three hybrid grain sorghum types ('SG-677', 'DS9300', and 'KS-735'), one forage sorghum ('NK300'), one silage corn type ('N91-19'), and two grain corn types ('Mexican June' & 'DX-93'). The trial is a randomized complete block with four replications. Replicate sizes for each of the varieties are comprised of 4 rows, 38 inches apart, with a row length of 20 feet. The size of each replicate is 253 square feet or 0.006 acres. Planting rates are half the recommended seeding rate. The sorghum the seeding rate was 10 pls. pounds per acre and the corn was 20 pls pounds per acre. A Kincaid no-till four row plot drill was used for sowing the seed. Sowing depth was 0.5 inches.

Evaluation factors include the ability to remain upright after senescence and retain dense foliage and are based on visual observations. Other factors include height (inches), averaged for several plants within each row, and emergence date.

Planting Plan Layout Field 2 Border 5 and 6

‘KS-735’ grain sorghum	‘SG-677’ grain sorghum	‘NK 300’ forage sorghum	‘Mexican June’ grain corn
‘DS 9300’ grain sorghum	‘N91-19’ silage corn	‘DS 9300’ grain sorghum	‘DX 93’ silage corn
‘DX 93’ silage corn	‘Mexican June’ grain corn	‘N91-19’ silage corn	‘SG-677’ grain sorghum
‘N91-19’ silage corn	‘NK 300’ forage sorghum	‘KS-735’ grain sorghum	‘NK 300’ forage sorghum
‘SG-677’ grain sorghum	‘DX 93’ silage corn	‘DX 93’ silage corn	‘DS 9300’ grain sorghum
‘NK 300’ forage sorghum	‘KS-735’ grain sorghum	‘Mexican June’ grain corn	‘N91-19’ silage corn
‘Mexican June’ grain corn	‘DS 9300’ grain sorghum	‘SG-677’ grain sorghum	‘KS-735’ grain sorghum
Rep 1	Rep 2	Rep 3	Rep 4
Border 5		Border 6	

← Irrigation Ditch →

Results and Discussion

2000

Planting was sown on 15 June 2000. Border five was irrigated on 22 June and border six on 26 June. Emergence for border five occurred for all varieties on 26 June and finished on 27 June. Emergence for border six occurred on 27 June and finished on 29 June. Each border received a total of six irrigations over the period of 22 June through 2 August. Each irrigation applied approximately 2.9 inches of water to each border for a total of 17.4 inches of water applied (well output = 430 gpm or 0.544 ac/in per hour and each border is 0.19 acres). Rainfall received was 2.6 inches in August, 1.01 inches in September and 4.5 inches in October 2000. Total water received was 25.51 inches during the growing season. Height measurements are presented in table one. Plants had matured by the end of November 2000.

The best performing variety with regards to foliage retention, resistance to lodging and desired height is ‘NK 300’. The corn varieties have been poor performers with regards to desired traits. Volunteer seedlings were not observed for any of the varieties.

Table One
2000 Evaluations

Variety	Height inches (8/3/2000)	Height inches (10/17/2000)	Remarks (10/17/2000)
‘Mexican June’ grain corn	28.5	80.3	Poor foliage retention, lodging prevalent
‘DX 93’ silage corn	38.8	81.4	Poor foliage retention many stalks lodging
‘N91-19’ silage corn	33.1	85.0	Poor foliage retention & lodging
‘KS-735’ grain sorghum	31.9	46.7	Best average height for grain sorghum/good foliage retention
‘NK-300’ forage sorghum	34.5	69.5	Best overall, excellent foliage retention, good height
‘DS9300’ forage sorghum	31.3	45.4	Good foliage retention
‘SG-677’ forage sorghum	30.7	42.3	Good foliage retention

2001

Planting was evaluated in January, March, May, with the final evaluation conducted in August 2001. In January, 'NK 300' had the best foliage retention, lodging resistance, and overall height. At this time, it was decided to continue the trial through 2001 and provide irrigation water to one border. The objective was to determine if the extra water promoted sprouting and regrowth. In March we found that all of the corn varieties did not persist and had lodged or retained low foliage density. Border 5 was irrigated 8 May and 31 May while no additional irrigation water was applied to border six. Between April and May all replications of 'NK 300' had lodged. This was due to abundant soil moisture and high winds from spring storm events. The abundant biomass of 'NK 300' smothered the plants crown and inhibited sprouting. All other sorghum varieties exhibited excellent sprouting from the crown. All corn varieties exhibited no sprouting. 'SG 677' had the best retention of the previous year's growth and upright form followed by 'KS 735' and '9300'. See table two for final evaluation on regrowth height and ranking based on % stand and foliage porosity. Again, no volunteer seedlings were observed.

**Table Two
2001 Evaluations**

Variety	Height inches (5/23/2001)	Height inches (8/16/2001) ¹	Remarks (8/16/2001)
'Mexican June' grain corn	0	0	All plants lodged early in the year. No sprouting from plant crown
'DX 93' silage corn	0	0	All plants lodged early in the year. No sprouting from plant crown
'N91-19' silage corn	0	0	All plants lodged early in the year. No sprouting from plant crown
'KS-735' grain sorghum	30.9	30.4	Good to fair stand with low porosity
'NK-300' forage sorghum	18.9	31.8	Poor to fair stand with high porosity.
'DS9300' forage sorghum	27.8	28.3	Fair to good stand with medium porosity.
'SG-677' forage sorghum	29.5	28.5	Good stand with low porosity.

1-Average height for both irrigated and non-irrigated borders.

In general, 'KS 735' and 'SG 677' had the best overall uniform stand, regrowth, and lowest porosity. Height differences were small between the irrigated and non-irrigated border. 'NK 300' had no height difference while 'KS 735' and 'SG 677' were on average two inches taller on the irrigated border versus the non-irrigated border. '9300' had the best response to irrigation with over 5 inches of extra growth on the irrigated border versus the non-irrigated border. Additional irrigations in the second year appear to be unwarranted, especially if you receive 3 to 4 inches of rainfall in the summer months. Wildlife values were considered high for dove, quail, and rabbits due to their extensive use of this planting. Observed insect activity (wasps, bees, aphids) was high during the first year of growth with little observed damage from insect pests. Observed insect activity during the second year was low.

Rainfall (inches)

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept	Oct.	Nov.	Dec.	TOTAL
2000	-----	----	----	----	----	1.38	0.18	2.61	1.01	4.52	0.99	0.08	10.77 in
2001	1.42	0.13	0.82	1.51	0.12	0.64	1.44	1.48	----	----	----	----	7.56 in

Border 5 received two irrigations in 2001 totaling 7.4 inches.

Conclusions

Corn varieties provided good height but poor foliage density during first year growth. Corn would be a poor herbaceous wind barrier due to lodging and lack of sprouting the following year. Sorghum, however, had good height, excellent retention of upright foliage, and excellent second year sprouting. It is apparent that sorghum can be an effective herbaceous wind barrier and require minimal amounts of irrigation water to keep it growing and functioning as a multi-year herbaceous wind barrier. The two best performing sorghum varieties are 'KS-735' and 'SG-677'. Volunteer seedlings were not found during the life of this trial. This information can be applied to the conservation practices such as Herbaceous Wind Barrier (603) and Cross-Wind Trap Strips (589C).