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Alfalfa Variety Trial Report – 2020, 2021, and 2022 Growing Seasons; SDSU Southeast Research Farm, Beresford, South Dakota

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Introduction

This report provides a summary of alfalfa yields observed in a variety trial established at the SDSU Southeast Research Farm in the spring of 2020 and conducted through the 2022 season. Lines of interest were submitted by different alfalfa seed companies for inclusion in the trial. Alfalfa is an important crop for ruminant nutrition in our region, and it is critical for profitable dairy production.

Methods

The plots were laid out in a randomized complete block design with six replications with a plot size is 5' by 18'. Plots were seeded on April 9, 2020. Whole plot yields were taken using a forage harvester (Model SMW-SCH-48; Swift Machine & Welding, Swift Current, Saskatchewan, Canada). Cutting dates were as follows: year one, July 9 and August 21, 2020; year two, May 28, June 28, and August 2, 2021; year three, May 27, June 30, and August 3, 2022. A fourth cutting was not taken in in the second and third years of the trial because drought conditions limited growth. Subsamples of fresh material were weighed and dried at 140°F to determine percent moisture. All yield data are presented on a dry weight basis. Some plots had skipped rows due to a planter row plugging, in order to correct for this, yields in these plots were adjusted on a percent basis using the average difference between the plots with and without skipped rows. The means were individually compared to the highest yielding line and separated with an LSD test ($P < 0.10$) using SAS statistical software.

Results

Temperature and rainfall data for the last three seasons are shown in Table 1, and Table 2, respectively. Cumulative rainfall over this three-year period is shown in Fig. 1, showing cumulative development of drought conditions over time. There were significant differences in the first cutting of 2022, but with the extreme drought stress experienced this last season, varietal differences in total dry matter production for the 2022 season were not statistically significant (Table 3). Total dry matter yields across the three years of the study of the top 50% of the entries are shown in Table 4.

Acknowledgement

The authors appreciate the contributions of the South Dakota Agricultural Experiment Station to support this research work.

Table 1. Temperatures[a] at the Southeast Research Farm - 2020, 2021, and 2022.

2020 Season	2020 Average Air Temps. (°F)		68-year Average Air Temps. (°F)		Departure from 68-year Average (°F)	
	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
January	26.7	10.5	26.6	5.9	+0.1	+4.6
February	33.4	14.3	32.0	11.0	+1.4	+3.3
March	48.0	26.9	44.2	23.0	+3.8	+3.9
April	57.6	30.2	59.9	35.0	-2.3	-4.8
May	66.4	47.1	71.8	47.3	-5.4	-0.2
June	86.7	62.9	81.6	58.0	+5.1	+4.9
July	86.4	69.3	86.0	62.2	+0.4	+7.1
August	85.2	59.2	83.8	59.4	+1.4	-0.2
September	76.2	47.5	75.6	49.4	+0.6	-1.9
October	55.6	29.3	63.1	37.3	-7.5	-8.0
November	50.5	24.7	45.3	23.7	+5.2	+1.0
December	38.1	11.8	30.8	11.6	+7.3	+0.2

[a] Computed from daily observations

2021 Season	2021 Average Air Temps. (°F)		69-year Average Air Temps. (°F)		Departure from 69-year Average (°F)	
	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
January	31.8	17.6	26.7	6.0	+5.1	+11.6
February	20.3	-0.2	31.8	10.8	-11.5	-11.0
March	52.0	27.2	44.3	23.1	+7.7	+4.1
April	59.3	33.0	59.9	35.0	-0.6	-2.0
May	70.1	47.3	71.8	47.3	-1.7	0.0
June	88.4	59.4	82.9	58.9	+3.8	+4.0
July	85.4	62.9	87.2	63.1	-0.8	+6.2
August	85.8	61.4	85.1	60.3	+0.1	-1.1
September	79.8	51.8	76.8	50.2	-0.6	-2.7
October	65.8	40.2	64.1	37.9	-8.5	-8.6
November	50.5	25.0	46.1	24.0	+4.4	+0.7
December	38.0	16.5	31.4	11.8	+6.7	0.0

[a] Computed from daily observations

2022 Season, through September	2022 Average Air Temps. (°F)		70-year Average Air Temps. (°F)		Departure from 70-year Average (°F)	
	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
January	31.6	3.0	26.7	6.0	+4.9	-3.0
February	33.9	5.4	31.8	10.8	+2.1	-5.4
March	46.6	21.8	44.3	23.0	+2.3	-1.2
April	57	30.4	59.8	34.9	-2.8	-4.5
May	71	48.8	71.8	47.4	-0.8	+1.4
June	83.8	60	81.7	58.1	+2.1	+1.9
July	87.5	63.6	86.0	62.2	+1.5	+1.4
August	85	61	83.9	59.4	+1.1	+1.6
September	81.2	51.4	75.7	49.5	+5.5	+1.9

[a] Computed from daily observations

Table 2. Precipitation at the Southeast Research Farm - 2020, 2021, and 2022 seasons.

2020 Season

Month	Precipitation 2020 (inches)	68-year Average (inches)	Departure from Avg. (inches)
January	0.39	0.45	-0.06
February	0.08	0.79	-0.71
March	2.73	1.45	+1.28
April	0.55	2.54	-1.99
May	2.16	3.55	-1.39
June	3.23	4.19	-0.96
July	1.95	3.08	-1.13
August	1.23	3.04	-1.81
September	0.35	2.81	-2.46
October	0.70	1.92	-1.22
November	0.91	1.13	-0.22
December	0.26	0.66	-0.40
Totals	14.54	25.61	-11.07

2021 Season

Month	Precipitation 2021 (inches)	69-year Average	Departure from Avg. (inches)
January	1.01	0.46	+0.55
February	0.30	0.78	-0.48
March	2.33	1.46	+0.87
April	2.45	2.53	-0.08
May	2.07	3.53	-1.46
June	0.71	4.14	-3.43
July	3.02	3.08	-0.06
August	3.88	3.05	+0.83
September	3.05	2.82	+0.23
October	3.32	1.94	+1.38
November	0.19	1.12	-0.93
December	1.26	0.67	+0.59
Totals	23.59	25.58	-1.99

[a] Computed from daily observations

2022 Season

Month	Precipitation 2022 (inches)	70-year Average	Departure from Avg. (inches)
January	0.13	0.45	-0.32
February	0.14	0.77	-0.63
March	1.41	1.46	-0.05
April	0.73	2.51	-1.78
May	3.13	3.52	-0.39
June	1.20	4.09	-2.89
July	1.89	3.06	-1.17
August	1.81	3.03	-1.22
September	1.70	2.80	-1.10
October	0.56	1.92	-1.36
Totals as of Oct 31	12.70	23.63	-10.93

[a] Computed from daily observations

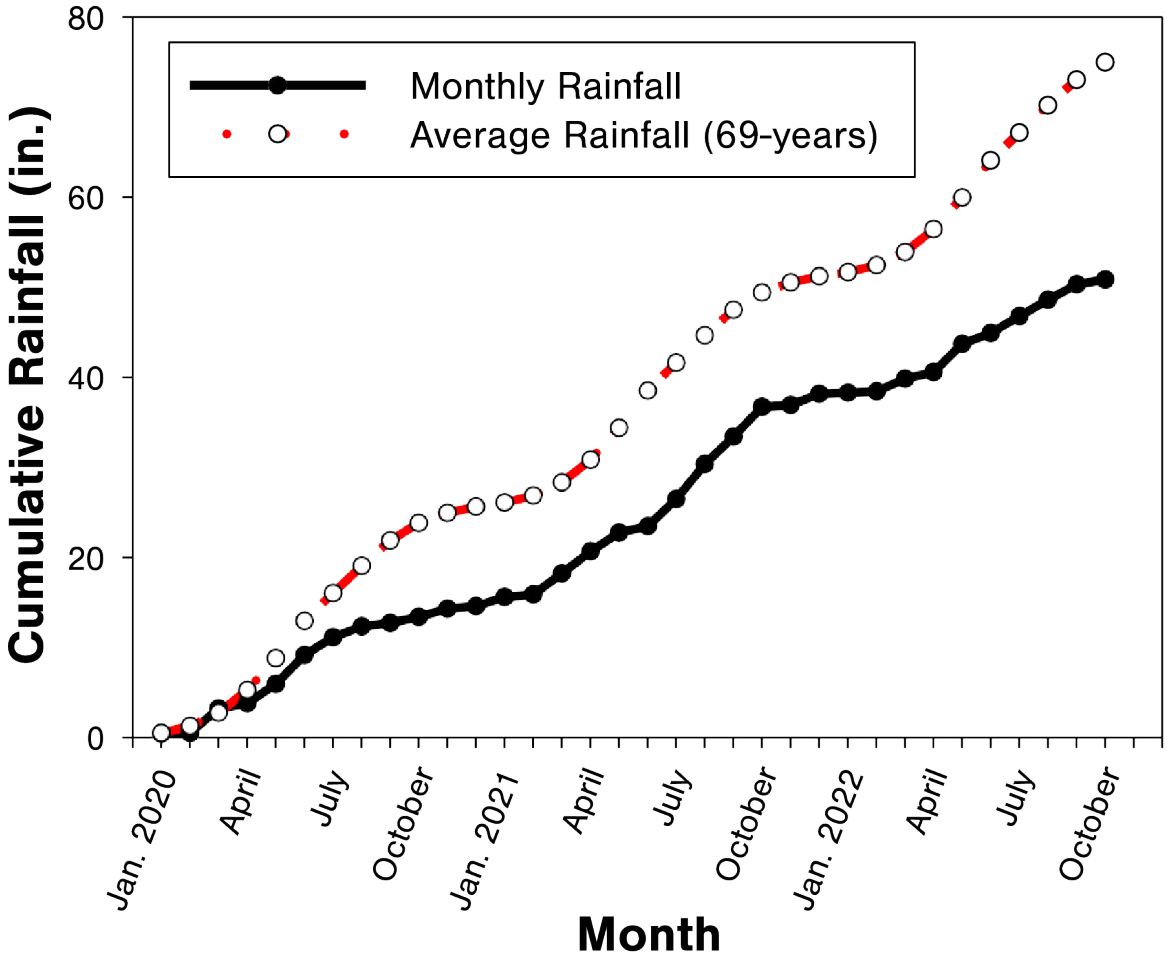

Fig. 1. Cumulative monthly rainfall relative to 69-year average rainfall at the SDSU Southeast Research Farm in Beresford, South Dakota, across the most recent three growing seasons (2020, 2021, and 2022). The difference between the lines is 24.1" at this writing (October 31, 2022).

Table 3. Dry matter yields from an alfalfa variety trial conducted at the Southeast Farm in Beresford, South Dakota in the 2022 season. Plots were established in the spring of 2020, making this the third season of the trial. Plots were harvested on May 27, June 30, and Aug. 3 of 2022. Yields were strongly impacted by drought stress. Data from the top 50 % of the entries are shown.

Line	First Cutting (tons/ac)	Second Cutting (tons/ac)	Third Cutting (tons/ac)	Total (tons/ac)
Viking 342	**2.45**	**0.66**	0.08	3.19
GA440XQ	**2.37**	**0.69**	0.08	3.15
Viking 394	**2.43**	0.63	0.07	3.13
DB Rush Hour	**2.38**	0.61	0.11	3.10
DSX174083	**2.33**	0.62	0.09	3.04
DB 540 Salt	**2.34**	0.63	0.06	3.03
Check (Vernal)	**2.47**	0.51	0.05	3.02
C04153364	2.08	**0.78**	0.14	3.00
DSX174082	**2.29**	0.61	0.09	2.99
Bluebird	**2.27**	0.61	0.08	2.96
DSX174085	**2.29**	0.59	0.07	2.95
HybriForce-4420	**2.25**	**0.65**	0.05	2.95
Mean	*2.27*	*0.60*	*0.07*	*2.94*
CV (%)	*10.8*	*25.0*	*116.5*	*12.5*
LSD (0.10)	*0.24*	*0.14*	*NS*	*NS*

Table 4. Total dry matter yields across three seasons from an alfalfa variety trial conducted at the Southeast Farm in Beresford, South Dakota. Plots were established in the spring of 2020, and the study was continued through the 2021 and **2022 growing seasons**. This period was marked by below-average rainfall much of the time, and drought stress impacted yields, particularly in the third year of the study. Data from the overall top 50 % of the entries are shown, along with the check ('Vernal').

Entry	2020 Total	2021 Total	2022 Total	Combined Total
	ton/ac	ton/ac	ton/ac	ton/ac
DSX174083	**3.15**	**4.76**	3.04	**10.95**
GA440XQ	**2.99**	**4.58**	3.15	**10.72**
DSX174082	**3.11**	**4.50**	2.99	**10.60**
Viking Organic 5200	**2.99**	**4.80**	2.77	**10.56**
Viking 394	2.75	**4.29**	3.13	**10.18**
DB Rush Hour	2.88	**4.16**	3.10	**10.14**
HybriForce-4400	**3.00**	**4.22**	2.90	**10.12**
Red Falcon	**2.94**	**4.27**	2.85	**10.06**
DB HeavyWeight	**2.93**	**4.15**	2.91	9.99
DB 540 Salt	2.63	**4.27**	3.03	9.92
Viking 342	2.58	**4.14**	3.19	9.91
C04153364	2.76	**4.10**	3.00	9.86
check (Vernal)	**2.92**	3.36	3.02	9.31
Mean	*2.87*	*4.06*	*2.94*	*9.88*
CV (%)	*7.9*	*15.9*	*12.5*	*9.7*
LSD (0.10)	*0.265*	*0.62*	*NS*	*0.92*