EFFECT OF TIME OF DESICCATION ON SOME QUALITY PARAMETERS OF SUNFLOWER SEED

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Abstract

Chemical desiccation with Reglone Forte has been tried in production fields with four sunflower hybrids. Reglone Forte (2L/ha) was applied at 7-day intervals from the end of pollination till maturity. Seed moisture was determined prior to each treatment. After harvesting, germination and energy of germination were determined. The highest average germination and energy of germination were found in the 21 DAF (days after flowering) treatments (the seed moisture at the time of treatment was 44.34%), the lowest energy of germination was in the 7 DAF treatment, and the lowest germination in the control treatment. The absence of significant differences among the 14 DAF, 21 DAF and 28 DAF treatments was an indication that there was no large increment in germination in the period after the average seed moisture reached 53.92%. Considering individual hybrids, the exception was hybrid NS-H-45 that reached high germination already in the first treatment. Decreasing of germination and energy of germination in the control treatment, caused by environmental factors during the maturity period, emphasized the importance of chemical desiccation.

Introduction

Introduction of chemical desiccation has solved many problems associated with mechanized sunflower harvest. Advantages of this cultural practice were noted by numerous authors (Shadden et al., 1970; Degtyarenko, 1976; Hill et al., 1974). If chemical desiccation is performed in early stages of plant maturation, it may impair seed yield and quality. Late treatment brings into question the economic effects of the practice. Recommendations for desiccation time vary from 25% seed moisture (Palmer and Sanderson, 1976.), 30-35% seed moisture (Degtyarenko, 1976; Kosovac and Sudimac, 1980), 40% seed moisture (Morozov, 1976, Gumanyiuc et al., 1980; Maširević and Glušac, 1999), 45% seed moisture (Gubbels and Dedio, 1985), at 35 days after drying of ray flowers (Dembiński et al., 1974). Using Reglone

14, 21, 28 and 35 days after full flowering, Dembinski et al. (1974) noticed that in the 28 DAF treatment, the germination was already higher than in the control and the later treatments. They explained that by development of disease in the later stages of the maturity.

The objective of this study was to determine the optimum time of chemical desiccation in commercial seed production of sunflower hybrids, in order to maximize the economic effects of the production from the point of seed germination and energy of germination.

Materials and Methods

Field trials were conducted in sunflower seed production fields in the course of 1994, 1995 and 1996. Each trial was established in three replicates, with the basic plot size of 17.5 m sq. (one row 25 m x 70 cm, one empty row between the treatments, to avoid drift effect).

Treatments were conducted at 7-day intervals starting from the end of pollination, i.e., from the end of flowering. Reglone Forte was used in 1% concentration, (2 L/ha of the preparation was added to 200 liters of water/ha). This dose, but mixed with a larger amount of water, was recommended by Maširević and Glušac (1999). Treatment was done with a portable sprayer.

The experimental materials were female components of hybrids NS-H-45, NS-H-111, NS-H-26 RM and NS-H-43.The end of pollination was defined as the end of pollination in the center of the head. Since the experiment was conducted in large seed production plots, average seed samples from entire heads were taken in order to make the results comparable. Seed moisture was determined by the classical method of drying at 105C till constant weight.

At full maturity, seed samples were taken in all the treatments, and after 2 months germination and energy of germination were determined on filter paper (temperature 26C).

The results obtained were statistically processed using analysis of variance for two-factorial and three-factorial trials and the regression analysis.

Results and Discussion

The values of seed moisture at the time of treatment varied in dependingon the treatment variant, year, and the location (Table 1).

The highest seed germination energy was measured in 1996, and was significantly different than in the two previous years. The lowest germination energy was in the year 1994 (Figure 1).

Significant difference of seed energy germination was found between hybrids NS-H-45 and NS-H-111, which exibited the highest and the lowest germination energy, respectively. For two other hybrids examined, NS-H-26 and NS-H-43, no significant differences in germination energy were found.

The highest average germination energy was measured at 21 DAF (91.71% at 44.34% seed moisture content) and the lowest average germination energy was measured at 7 DAF (86.33%).

There were no significant differences between the 14, 21 and 28 DAF treatments, while all three treatments caused significantly higher germination energy in comparison to the 7 DAF treatment and the control.

Table 1. Seed moisture content at the time of desiccation.

Year Y	Hybrid H	Term of treatment T					x YH	x Y
		7 DAF	14 DAF	21 DAF	28 DAF	Check		
1994	NS-H-45	66.58	53.06	34.18	25.44	12.13	38.28	41.42
	NS-H-111	69.72	60.53	51.27	39.19	12.36	46.61	
	NS-H-26	59.71	47.57	31.59	18.28	12.43	33.92	
	NS-H-43	66.11	60.27	53.96	41.32	12.61	46.85	
	x YT	65.53	55.36	42.75	31.06	12.38		
1995	NS-H-45	71.87	59.18	55.42	38.96	13.39	47.76	40.62
	NS-H-111	67.06	52.06	39.50	22.18	12.20	38.60	
	NS-H-26	54.78	43.51	25.20	22.10	11.24	31.37	
	NS-H-43	68.24	57.13	49.27	35.96	13.15	44.75	
	x YT	65.49	52.97	42.35	29.80	12.50		
1996	NS-H-45	73.59	57.57	45.14	28.64	12.59	43.50	42.62
	NS-H-111	63.39	47.08	43.73	29.60	12.36	39.23	
	NS-H-26	58.92	49.28	41.32	22.40	8.36	36.06	
	NS-H-43	67.01	59.80	61.63	54.34	15.62	51.68	
	x YT	65.73	53.43	47.96	33.74	12.23	x H	
x HT	NS-H-45	70.68	56.60	44.91	31.01	12.70	43.18	
	NS-H-111	66.72	53.22	44.83	30.32	12.31	41.48	
	NS-H-26	57.80	46.79	32.70	20.93	10.68	33.78	
	NS-H-43	67.12	59.07	54.95	43.87	13.79	47.76	
x T		65.58	53.92	44.34	31.53	12.37		

LSD	1994			1995			1996		
	H	T	H x T	H	T	H x T	H	T	H x T
5%	2.11	2.36	4.71	2.79	3.12	6.24	2.50	2.80	5.60
1%	2.82	3.15	6.30	3.73	4.18	8.35	3.35	3.75	7.49

LSD	Y	H	T	Y x H	Y x T	H x T	Y x H x T
5%	1.22	1.40	1.57	2.43	2.72	3.14	5.44
1%	1.61	1.86	2.08	3.22	3.60	4.15	7.19

The seed moisture content at the time of desiccation did not affect the germination energy significantly. This is indicated by the low values coefficient of determination obtained by the regression analysis. Slightly higher values were determined for the hybrid NS-H-43 ($r2=0.56^{**)}$) than for the hybrid NS-H-111 ($r2=0.52^{*}$). In the hybrid NS-H-45 there were almost no changes of germination with the different seed moisture content, at the time of dessication. There was a general trend of increase of the germination energy with the decrease of seed moisture content in all examined hybrids. The maximum values of the regression curves were reached at different levels of seed moisture, from 32.79% in hybrid NS-H-26 RM up to 48.71% in hybrid NS-H-43.

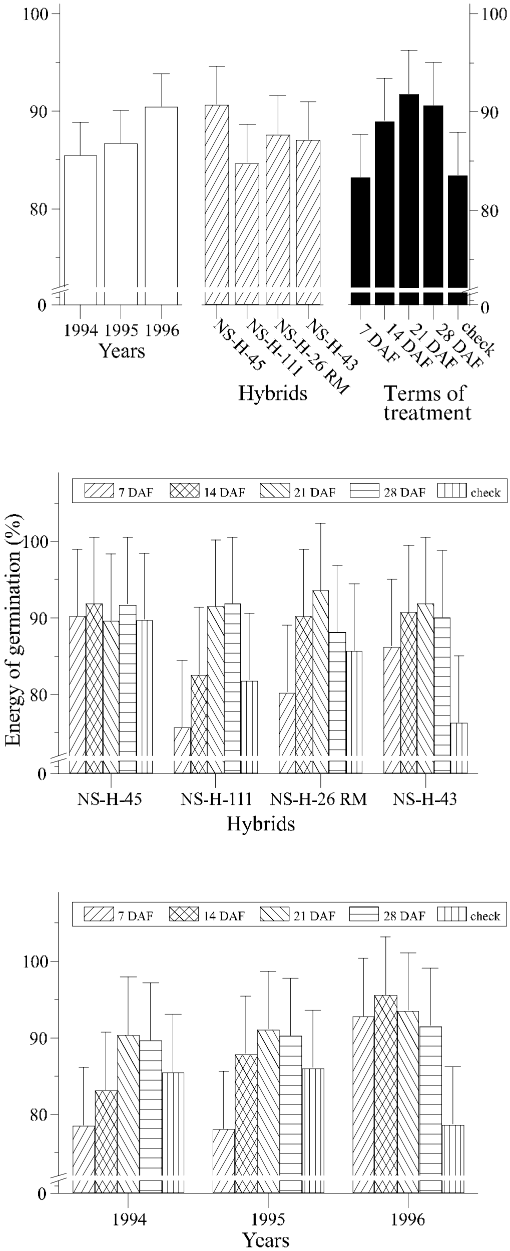

Figure 1. Energy of germination in NS hybrids.

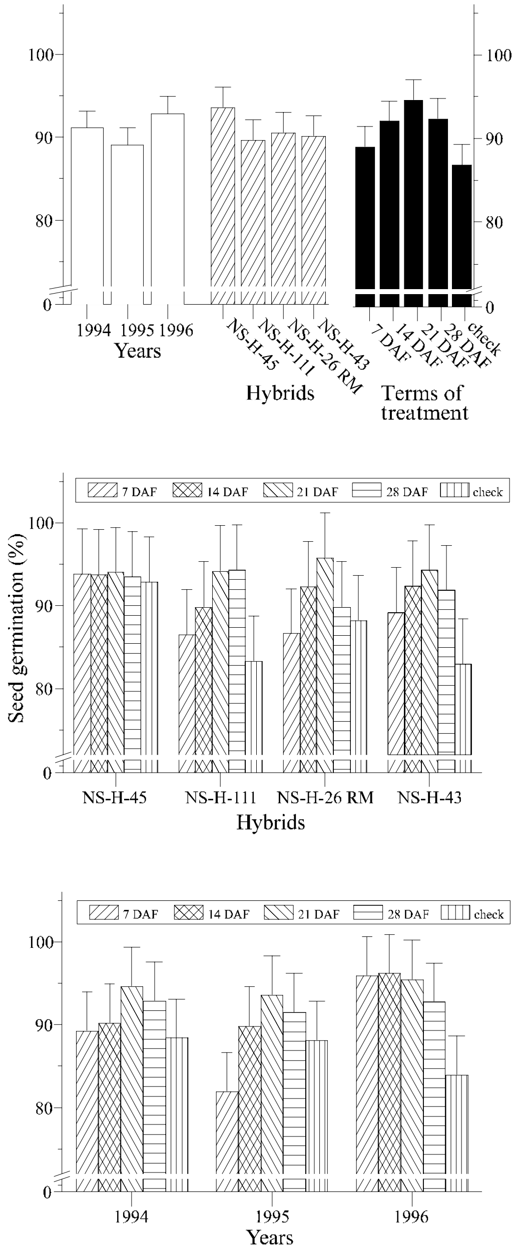

Figure 2. Seed germination in NS hybrids.

The highest average seed germination was achieved in the year 1996 (92.89%), and the lowest in the year 1995 (89.02%), and the difference between these two years was highly significant (Figure 2).

The highest seed germination was measured in the hybrid NS-H-45, and was significantly higher in comparison with two other hybrids which did not differ mutually.

The highest germination was measured in the 21 DAF treatment (94.60%, seed moisture content 44.34%), while the lowest germination was determined in the control (86.86%). There were no significant differences between treatments at 14, 21 and 28 DAF, but all three treatments induced significantly higher germination when compared to the treatments 7 DAF and control.

The seed moisture content at the time of dessication had a different influence on seed germination in different hybrids. The highest values of the coefficient of determination were determined in hybrids NS-H-43 ($r2=0.56^{**}$) and NS-H-111 ($r2=0.55^{*}$), while in other hybrids examined these values were very low. In all hybrids the germination increased as the seed moisture decreased, and theoretical maximum values were reached at different levels of seed moisture content, from 35.71% in the hybrid NS-H-26RM up to the 64.49% in the hybrid NS-H-45.

The highest germination energy and germination were achieved on average by the 21 DAF treatment, at the seed moisture content of 44.34%, but actually there was no significant increase from the 14 DAF treatment. Significant differences between hybrids appeared. No differences between treatments were observed in hybrid NS-H-45, and maximum values of germination energy and germination were achieved before the first treatment, at a high moisture content. In other hybrids examined there were significant differences between treatments, and an increase in vitality up to the treatments 21 and 28 DAF was observed. For the hybrid NS-H-45 the regression curve did not indicate any regular tendency, while in other hybrids the regression maxima of the germination energy were achieved at seed moisture of 35%, 33% and 49% in hybrids NS-H-111, NS-H-26 RM and NS-H-43, respectively. The maximum value of germination was achieved at 2-3% higher seed moisture content than the germination energy.

According to our results early dessication has a lower negative influence on the germination energy and germination particularly, than on the yield and the mass of 1000-seed. This is in accordance with the results published by Polyakov and Shepetina (1968), Dembinski et al. (1974), and Gubbels and Dedio (1985). The results obtained by the authors that have examined the premature harvest confirm the hypothesis that germination and the germination energy achieve their peaks before the physiological maturity. Crnobarac (1987) had obtained the first class quality seed after harvesting 28 DAF at a seed moisture content of 57%, and Rađenović (1989) underlined that seed of high quality can be harvested at 49-53% seed moisture content, when the yield is not completely formed.

All hybrids examined exhibited a decrease in germination energy and germination under control conditions, while in two hybrids this decrease was not significant. This decrease was particularly distinct in the year 1996, with lower temperatures and higher precipitation, which lead to the postponed maturation and higher pathogen development. In that year, the lowest values were determined in the control conditions, and the highest values were determined in other treatments, when compared to all other examined years. This indicated that chemical desiccation is particularly favorable in years with higher precipitation. Similar results were obtained by Zimmerman and Zimmer (1978), Shepetina and Rogozheva (1971), Palmer and

Sanderson (1976) and Rađenović (1989). As an explanation these authors cited the higher incidence of attack of sunflower pathogens, especially of *Alternaria* and *Rhizopus*, as well as low temperatures.

Conclusions

Hybrid NS-H-45 had significantly higher germination energy and germination, while hybrid NS-H-111 exhibited the lowest values, but was not significantly different from the other two examined hybrids.

The highest germination energy and germination were achieved in the 21 DAF treatment, with an average seed moisture content of 44.34%, but in all hybrids examined high values were reached earlier, with some of them at the first treatment. The average lowest germination energy for hybrids was achieved in the 7 DAF treatment, but for germination it was under control conditions. The environmental factors and treatments exhibited higher influence on the germination energy than on the germination itself. The regression curves indicate that the highest germination was reached earlier than the highest germination energy, which means that too early of dessication would have more influence on the germination energy than the germination.

In all hybrids there was a higher or lower decrease of the germination energy under control conditions in comparison to the most of the treatments, which is probably the result of the effects of different factors affecting the seed maturation.

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