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Effect of Planting Time on Maturity, Yield and Quality of Soybeans in Southeast Missouri

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Studies conducted by the Missouri Agricultural Experiment Station in cooperation with the U. S. Regional Soybean Laboratory, Division of Forage Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture.

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Summary

Among the five varieties planted after June 1, S-100 had a slight advantage over Ralsoy in that it matured a few days earlier and yielded a little more seed. Planted prior to June 1, Ralsoy had a slight advantage over S-100. From late planting, July 10, Dunfield matured earlier than any of the other varieties but it yielded less seed. Strain S-100 yielded the highest from plantings after June 1, and matured only twelve days later than Dunfield when planted July 10.

Soybean harvest can be hastened as a means of making way for small grain on the soybean field by planting the early maturing varieties early. Both the use of an early maturing variety and early planting are essential to early maturity. While this practice may cause considerable reduction in the soybean yield and quality, it is still considered sound from the standpoint of total production by the rotation.

If planting is delayed because of wet weather or until after the harvest of small grains, the use of late maturing varieties is recommended, as early varieties will give lower yield of seed without much gain in earliness of maturity.

The date of planting which produced the highest seed yields also resulted in seed with the highest oil content. In general, the percentage of protein varied inversely with percentage of oil. The iodine number of the oils tended to increase with lateness of planting.

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The long growing season in southeast Missouri allows a planting season for soybeans extending from mid-April to mid-July. A knowledge of the most favorable planting time and the effect it has upon maturity, seed yields, seed quality and seed composition is important in soybean production. A study of such effect was conducted on the Southeast Missouri Experiment Field from 1942 through 1945. The five varieties included in the study and the days required for their maturity near Sikeston if planted on June 1 are as follows: Ralsoy 137, S-100 124, Boone 117, Chief 109, and Dunfield 100. Each variety was planted at 20 day intervals extending from April 20 through July 10.

Date of Planting Affects Maturity

Results show that the number of days required by any of these varieties from planting to maturity is not constant but is influenced considerably by the date of planting. For example, Ralsoy planted April 20 required 174 days to mature but when planted July 10 required 102 days. Dunfield planted April 20 matured in 122 days, and when planted July 10 matured in 88 days.

Date of planting influences the date of maturity least among late maturing varieties and most among early maturing varieties. Early planting of Dunfield, Chief, and to a lesser extent Boone, caused the date of their maturity to be considerably advanced. On the other hand, Ralsoy and to a lesser extent S-100, were influenced very little in their date of maturity by the date of planting. Ralsoy planted April 20 matured only 9 days before Ralsoy planted July 10. The first planting matured October 11, and the last planting matured October 20. Dunfield, an early maturing variety, planted April 20 matured August 20; Dunfield planted July 10 matured October 6. Similar comparisons of the other varieties may be made from the data presented in Table 1.

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Table 1. - Maturity Data, Average of 1942 through 1945.

Date Planted	Varieties									
	Ralsoy		S-100		Boone		Chief		Dunfield	
	date mat.	days to mat.	date mat.	days to mat.	date mat.	days to mat.	date mat.	days to mat.	date mat.	days to mat.
4/20	10/11	174	9/20	153	9/14	147	9/8	141	8/20	122
5/10	10/14	157	9/30	143	9/18	131	9/13	126	8/30	112
6/1	10/15	137	10/2	124	9/25	117	9/17	109	9/8	100
6/20	10/18	120	10/7	109	10/6	108	9/28	100	9/21	93
7/10	10/20	102	10/18	100	10/16	98	10/10	92	10/6	88

Early maturity was obtained only by planting early maturing varieties at an early date, whereas early planting of full season varieties resulted in only slightly advancing the maturity date. These studies show that if planting is delayed until the first week in July by weather conditions or by awaiting the removal of a small grain crop, the use of Dunfield or any other similarly early variety will result in only slightly earlier maturity than if a long season soybean, such as Ralsoy, is planted.

Date of Planting Affects Yield and Quality

Effect on Yield.—Maximum grain yields result from planting a full season variety after the soil has become thoroughly warm in the spring as shown in Table 2. At this time conditions are most favorable for prompt germination and rapid growth. Earlier planting prevents working the seed bed sufficiently to kill weeds. When the soil is cold germination and growth are very slow allowing weed growth to start ahead of the crop. On the other hand, if planting is delayed until late in the spring, the yield is reduced and often dry weather prevents the obtaining of good stands.

Table 2. - Seed Yields in Bushels per Acre and Seed Quality from Date of Planting Test, Average of 4 years, 1942-1945.

Date Planted	Varieties									
	Ralsoy		S-100		Boone		Chief		Dunfield	
	Y	*Q	Y	*Q	Y	*Q	Y	*Q	Y	*Q
4/20	22.5	1.0	20.3	2.0	17.9	2.9	16.4	2.9	13.4	4.0
5/10	24.7	1.0	22.2	1.7	18.8	2.3	18.4	3.0	14.2	4.2
6/1	23.2	1.0	23.6	1.1	19.3	1.7	19.3	2.2	16.4	3.3
6/20	20.7	1.1	22.4	1.3	18.3	1.2	19.5	2.1	16.6	1.6
7/10	15.7	1.2	17.0	1.7	14.1	1.2	13.9	1.5	13.3	1.2

*Seed quality index ranges from 1 (very good) to 5 (very poor).

The most favorable period for planting early maturing varieties is later than that for planting late maturing varieties. That is because the earlier plantings of earlier varieties in southeast Missouri bloom and begin seed development during the dry, hot period that usually occurs in the area during the latter part of July and early August. Yields of early maturing varieties planted July 10 were reduced, however, because of the short period remaining between planting and maturity. Highest yields from early maturing varieties were obtained from planting at a time that would allow blooming and seed formation to follow immediately after the dry, hot period. Where all varieties were planted at the optimum dates for Boone, Chief, or Dunfield, the yields of Ralsoy and S-100 were still superior to the earlier strains. At all dates at which the plantings were made, Ralsoy, a late variety, and S-100 closely approaching a late variety, yielded more than Boone, Chief, or Dunfield. S-100 averaged higher in yield than Ralsoy for the last three dates of planting.

Effect on Seed Quality.—Seed quality data are included in Table 2 for the average of the four years. The seed quality was recorded on a scale of 1 to 5 as follows: 1. very good; 2. good; 3. fair; 4. poor; 5. very poor. The factors considered in estimating seed quality were development of seed, wrinkling, damage, and color for the variety.

The planting date affected the seed quality of Boone, Chief, and Dunfield considerably but had little effect on Ralsoy and S-100. The seed from all plantings of Ralsoy and S-100 was good to very good in quality. The first two plantings of Boone and Chief were inferior in seed quality to the latter three dates. The quality of Dunfield was poor for the first two plantings but progressively better with the later plantings.

These results indicate that seed quality is influenced more by maturity date than by planting date. The poorest quality seed was from the earliest maturing crops and quality steadily improved with later maturity. For example, the early plantings of Dunfield matured earliest and produced the poorest quality seed. The last planting of Dunfield matured relatively late and the seed was of good quality. All plantings of Ralsoy matured relatively late and produced seed of good to very good quality. Apparently early maturity resulted in the development of the seed under relatively hot, dry conditions which are conducive to poor seed quality. The indications are that planting date influences the seed quality of the early maturing varieties but has little effect on the late varieties.

Date of Planting Affects Chemical Composition

For industrial utilization, oil and protein are the most important constituents of the soybean seed. The oil is relatively more valuable than the protein and more interest is centered in the oil content of the crop. Both oil and protein content are varietal characteristics which are influenced by environmental conditions. The oil and protein content, and the drying quality of the oil as measured by iodine number; were determined for each variety for each planting date. These data for the average of the four years are reported in Table 3.

With the exception of the June 20 planting of Ralsoy, no appreciable difference in oil content of Ralsoy, S-100, Boone or Chief resulted unless planting was delayed until after June 20. The oil content of

Table 3. - Protein and Oil Content from Date of Planting Test, Average of Four Years, 1942 through 1945

Variety	Date Planted	Protein Content	Oil Content	Iodine No. of the Oil
		%	%	
Ralsoy	4/20	41.5	20.4	133.3
	5/10	40.5	20.8	133.5
	6/1	40.1	20.7	133.9
	6/20	41.3	19.6	133.2
	7/10	42.7	18.8	134.2
S100	4/20	42.0	19.6	128.9
	5/10	41.6	19.5	130.0
	6/1	41.0	19.9	130.4
	6/20	42.2	19.6	131.4
	7/10	42.2	18.7	133.6
Boone	4/20	42.4	20.8	121.9
	5/10	41.7	20.9	124.8
	6/1	40.3	21.2	127.4
	6/20	40.6	21.5	130.9
	7/10	42.3	19.6	131.8
Chief	4/20	41.0	21.2	127.3
	5/10	40.0	21.6	128.7
	6/1	39.8	21.5	129.5
	6/20	39.6	21.4	131.5
	7/10	40.8	19.8	133.8
Dunfield	4/20	40.0	23.0	115.1
	5/10	41.5	21.5	113.8
	6/1	40.9	21.9	120.8
	6/20	38.7	22.6	127.1
	7/10	39.4	20.7	131.7

Dunfield was somewhat more variable. The lowest oil content soybeans of all varieties were from the July 10 planting.

The protein content showed a tendency to vary inversely with oil content. That is, high oil content was associated with relatively low protein, and low oil with relatively high protein. Apparently the climatic conditions favorable for high protein are also conducive to low oil.

The iodine number of an oil is an indication of its drying quality and its usefulness for paint and varnish production. As shown in Table 3, the iodine numbers of all varieties tended to increase with lateness of planting. Apparently, there is a relationship between temperature during seed development and the iodine number of the oil. Lower temperatures during seed development produce oil of higher iodine numbers. All iodine numbers of Ralsoy were approximately the same because all plantings matured at about the same time under similar temperatures. The various plantings of Dunfield matured over a long period under different temperatures, and thus produced oil of widely different iodine numbers.