PHENOLOGICAL RECORDS OF THE PRAIRIE FLORA[1]

R.C. Russell

Introduction

Phenological records have been collected by members of the staffs of the Canada Agriculture Laboratories of Plant Pathology at Winnipeg, Saskatoon, and Edmonton from 1936 to 1961 inclusive. These records were taken at Winnipeg by Bjorn Peturson, at Saskatoon by R. C. Russell, R. J. Ledingham or M. S. Rahrey, and at Edmonton by M. W. Cormack (1936-48), S. G. Fushtey (1949-53), and W. P. Campbell (1954-61). The records show the earliest dates of flowering for a considerable number of native prairie plants and include the dates of seeding, emergence, heading, and maturity of wheat on early-sown plots. All the data from the three stations were summarized annually by the author and published in the reports of the Canadian Plant Disease Survey for the corresponding years.

Several principles were taken into consideration when planning this project. In the first place, species that could be observed regularly without travelling far afield were selected and, as far as possible, the same trees or herbs in the same location, were used each year. The earliest date on which fully-opened flowers were seen or on which pollen was being shed, in the case of certain trees, was the date recorded, Moss (2), in collecting somewhat similar data at Edmonton, recorded the date when each species was in full bloom, thus his average dates for particular species in most cases are somewhat later than ours, When feasible, the same species were used at the three stations, butdifferences in local flora were such that only 25 per cent of the total species recorded were common to all stations, Since we were interested in relating the results of the observations of native plant development with that of wheat from seeding time to harvest, it was desirable to observe a succession of species from early spring to late mid-summer.

Recorded Observations

Table 1 summarizes the results of the phenological observations on native plants, The scientific names listed in the first column of the table are, with few exceptions, those used in P.A. Rydberg's "Flora of the Prairies and Plains of Central North America". Where different but closely related species were used at one or more of the stations, they are listed by their generic and their common names, e. g. Crataegus sp. (Hawthorn).

It may be seen that there is a spread of from 10 to 40 days between the earliest and latest recorded anthesis of the different species, the average spread being about one month. On the whole, the more years that a species was observed the greater the spread is likely to be, and the more reliable the calculated average date of flowering. No species is listed that was observed for less than 6 years and the majority were observed for over 15 years, The maximum number of years was 26.

The rate of development of wheat for the same period of years at Winnipeg, Saskatoon, and Edmonton is indicated by the figures in Table 2.

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Table 1. Extreme Range and Average Flowering Dates of Native Plant Species, Winnipeg, Saskatoon, and Edmonton, 1936-1961.

	Winnipeg			Saskatoon			Edmonton		
	Earliest record	Latest record	Average date	Earliest record	Latest record	Average date	Earliest record	Latest record	Average date
Pulsatilla ludoviciana	4/4	20/4	*(7)11/4	5/4	3/5	*(26)18/4	10/4	18/5	*(9)25/4
Corylus rostrata					-		13/4	10/5	(9)27/4
Populus tremuloides	5/4	10/5	(24)25/4	8/4	9/5	(26)25/4	13/4	14/5	(26)27/4
Phlox hoodii				16/4	16/5	(26)29/4	-		
Acer negundo	14/4	22/5	(22) 7/5	24/4	19/5	(26) 7/5	22/4	20/5	(25) 3/5
Shepherdia canadensis'			-				13/4	17/5	(9) 3/5
Salix petiolaris				24/4	19/5	(13) 7/5	13/4	17/5	(6) 5/5
Betula papyrifera	-	-	-	27/4	25/5	(26)11/5	20/4	30/5	(25) 7/5
Prunus americana	26/4	29/5	(24)14/5						
Amelanchier alnifolia	28/4	31/5	(24)18/5	28/4	27/5	(26)15/5	5/5	31/5	(26)17/5
Prunus pensylvanica	-			13/5	4/6	(25)20/5	6/5	29/5	(26)18/5
Viola rugulosa				7/5	1/6	(26)21/5	7/5	3/6	(23)23/5
Smilacina stellata	16/5	3/6	(15)24/5	14/5	4/6	(23)25/5	10/5	7/6	(23)25/5
Crataegus sp. (Hawthorn)	1/5	9/6	(23)24/5	12/5	12/6	(19)28/5	19/5	18/6	(18)30/5
Prunus sp. (Chokecherry)	3/5	11/6	23)25/5	13/5	15/6	(23)28/5	18/5	14/6	(23)28/5
Cornus sp. (Dogwood)	20/5	14/6	16) 1/6	14/5	15/6	(26)30/5	20/5	15/6	(23) 1/6
Viburnum lenta 0	13/5	17/6	24) 3/4				-	-	-
Hierochloe odorata tentago	12/5	4/6	10)23/5	10/5	9/6	(20)20/5			
Elaeagnus commutata	-			20/5	21/6	(26) 4/6	26/5	21/6	(24) 5/6
Hedysarum americanum	-			29/5	17/6	(13) 8/6			
Thalictrum turneri				-	-	-	28/5	15/6	(10) 5/6
Maianthemum canadense	-			-			28/5	13/6	(10) 6/6
Lonicera glaucescens	-			25/5	22/6	(22) 8/6	22/5	20/6	(23) 7/6
Achillea lanulosa				2/6	22/6	(25)10/6	18/6	6/7	(18)27/6
Diholcos bisulcatus				29/5	22/6	(16)10/6	-		
Anemone canadensis	24/5	19/6	19) 6/6	30/5	29/6	(25)11/6	8/6	30/6	(20)23/6
Viburnum trilobum	18/5	20/6	12) 9/6	-	-	-	30/5	17/6	(8) 8/6
Viburnum pubescens	23/5	21/6	19)10/6	-	-				
Galium boreale				3/6	1/7	(23)14/6	6/6	6/7	(12)21/6
Rosa alcea				10/6	7/7	(25)20/6	2/6	24/6	(9) 9/6
Campanula petiolata	-			12/6	8/7	(25)22/6	12/6	19/7	(9)11/7
Bromus inermis	12/6	4/7	(23)21/6	12/6	6/7	(26)23/6	18/6	16/7	(26)25/6
Gaillardia aristata		-		15/6	8/7	(22)24/6		-	-
Sairaea alba				24/6	10/7	(23)30/6		-	-
Chrysopsis hirsutissima	-	-		18/6	11/7	(20) 1/7		-	-
Symphoricarpos occidentalis	17/6	15/7	(15)27/6	20/6	12/7	(20) 2/7	23/6	11/7	(22) 5/7
Phleum pratense		-	-				29/6	15/7	(23) 8/7
Chamaenerion spicatum	-	-	-	24/6	18/7	(8) 3/7	1/7	16/7	(23) 9/7
Lactuca pulchella		-	-	27/6	26/7	(21) 8/7	10/7	20/7	(13)14/7
Psoralidium argophyllum	-	-	-	25/6	19/7	(22)10/7		-	
Apocynum androsaemifolium		-	-				20/6	30/7	(10)11/7
Agastache anethiodora	-	-					4/7	2/8	(17)12/7
Solidago missouriensis	-	-		8/7	23/7	(13)14/7		-	-
Cirsium flodmanii			-	8/7	22/7	(9)16/7		-	
Solidago canadensis	18/7	28/7	(6)21/7				11/7	6/8	(22)21/7
Grindelia perennis			-	13/7	1/8	(23)23/7		-	-
Oligoneuron canescens				18/7	7/8	(22)26/7			
Aster conspicuus	-	-	-				20/7	29/7	(10)23/7
Aster ericoides		-		14/7	8/8	(15)29/7			
Aster laevis	-			17/7	11/8	(22)30/7	21/7	12/8	(23)30/7

*Figures in brackets show the number of years that records were made for each species.

Table 2. Records of Wheat Development at Winnipeg, Saskatoon, and Edmonton (1936-1961); Early, Late, and Average Dates of Seeding, Emergence Heading, and Maturity. ——

	Winnipeg			Saskatoon			Edmonton		
	Earliest record	Latest record	Average date	Earliest record	Latest record	Average date	Earliest record	Latest record	Average date
Seeding	12/4	* 2/6	+(24)29/4	10/4	13/5	+(26)30/4	17/4	19/5	+(26)2/5
Emergence	24/4	29/5	(17)11/5	30/4	26/5	(26)13/5	2/5	29/5	(25)12/5
Heading	14/6	16/7	(22) 1/7	23/6	17/7	(26) 2/7	23/6	20/7	(21 4/7
Maturity	23/7	29/8	(24) 9/8	19/7	28/8	(26) 9/8	4/8	7/9	(26)20/8

* Excessive moisture prevented the commencement of seeding operations on heavy clay soil after one of their periodic spring floods. No date was recorded for emergence at Winnipeg that year.

t The number of years for which we have records is shown in brackets.

Thatcher wheat was sown on the plots observed throughout most of the period involved, but other varieties of hard red spring wheat were used occasionally.

Discussion

While many of the species listed in Table 1 were recorded at only one or two of the stations, 10 of them, Populus tremuloides, Acer negundo, Amelanchier alnifolia, Smilacina stellata, Crataegus spp. (hawthorn), Prunus spp. (chokecherry),; Anemone canadensis, Bromus inermis and Symphoricarpos occidentalis, were observed for 15,or more years at all three stations. The behaviour of these 10 species should give a fairly good measure of the relative earliness of the season at the three stations. If we list the average dates of flowering of these 10 species at each of the stations, take the totals and divide each by 10, we get the values 209, 224, and 246, These figures indicate very roughly the relative earliness of the season for the period starting at the first of May and ending at the last of Juhe at the three stations. They suggest that, on the average, the native vegetation in the spring develops' earliest at Winnipeg, a little later at Saskatoon, and somewhat later still at Edmonton. The same remarks apply to the average date of the commencement of wheat seeding at the three stations. The average date of maturity was however, considerably later at Edmonton than at Winnipeg and Saskatoon. The differences in general are not as great as one might expect in view of the differences in latitude of the three stations. This emphasizes the fact that the isothermal lines run from southeast to northwest across the Prairie Provinces, rather than east and west.

The average maximum variation in time of appearance of each species at the different stations over a period of 15 to 25 years was approximately one month. Naturally this spread varied somewhat in different instances. For example, the greatest variation noted was 40 days in the cases of Betula papyrifera and Apocynum androsaemifolium at Edmonton. The smallest variation was abdut 10 days, e. g. Lactuca pulchella and Aster conspicuus at Edmonton. It should be noted, however, that these two species had been recorded for only 13 and 10 years, respectively. Perhaps Spiraea alba at Saskatoon, and Phleum pratense at Edmonton are better examples, as each was recorded for 23 years. The spread in each case was 16 days,

The influence of weather conditions on the time of flowering of the species observed was not recorded except in a general way. Bassett et al. (1) found apparent differences, in the reactions of different species at Ottawa to average maximum temperatures. As far as our experience goes, it was quite apparent that periods of cool cloudy weather retarded the development of the prairie flora, especially in the first half of the season, whereas excessive warmth hastened flowering. In certain unusually dry periods, when temperatures were high and moisture reserves at a low level in the soil, it appeared as though flowering of some species in June and July was actually retarded or entirely inhibited under specially arid conditions,

The rate of development of wheat at the three stations appeared to be governed by the same factors that affected the growth of native plants. However, an artificial variation was introduced in the case of wheat becauce the time of planting was not determined entirely by weather conditions each year, At one station, at least, the tendency in recent years has been to sow the wheat at a

later date than formerly to allow time to cultivate the land to destroy a crop of weed seedlings and to allow the soil to warm up somewhat before the grain is sown. It was noticeable from the records that early seeding was not always followed by early maturity. The type of weather that prevailed throughout the growing season determined the number of days from seeding to harvest. Usually, early-sown crops took more days to reach maturity because of cooler conditions during the earlier part of spring.

As the result of certain experiments conducted by the Field Yusbandry Department of the University of Saskatchewan (unpublished), to ascertain the optimum time to sow-wheat, it was concluded that the beet time to sow wheat to obtain highest yields of grain, on the average, was about the 8th of May. In relatively early seasons, however, seeding should be done nearer the first of May, and in later seasons about the 15th of May. At Saskatoon the 8th of May coincides very closely with the average date of flowering of Acer negundo L,, hence it seems reasonble to suppose that farmers in that district could use the commencement of flowering of this species to determine the best time to seed wheat in any particular year.

References

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CANADA AGRICULTURE RESEARCH STATION,
UNIVERSITY SUB POST OFFICE,
SASKATOON, SASK.