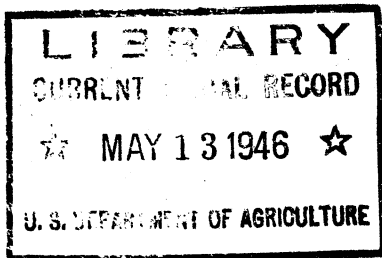


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Published with the approval of the Director of the Budget. Issued on the 1st and 15th of each month. This volume will consist of 12 numbers and the contents and index.

Subscription price:

Entire Journal: Domestic, \$2.25 a year (2 volumes)

Foreign, \$3.00 a year (2 volumes)

Single numbers: Domestic, 10 cents

Foreign, 15 cents

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JOURNAL OF AGRICULTURAL RESEARCH

VOL. 72

WASHINGTON, D. C., MAY 1, 1946

No. 9

LATEX-TUBE AREAS OF THE ROOTS AND LEAVES OF THE RUSSIAN DANDELION¹

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INTRODUCTION

The distribution of the latex tubes and their appearance in cross section of the root of the Russian dandelion (*Taraxacum kok-saghyz* Rodin) have been shown by Artschwager and McGuire² in their morphological and anatomical studies of this plant. The object of the present investigation was to determine whether the percentage of latex-tube area in any one plant is sufficiently uniform in its various roots and leaves to justify the collection in the field of one leaf and one secondary root for the determination of latex-tube area. A technique was developed for this work by which the latex tubes could be clearly differentiated in the cross sections and thus could be easily counted and measured with the microscope.

TECHNIQUE USED IN THE INVESTIGATION

1. Segments of roots and petioles 3 mm. in length were fixed 24 hours in Flemings fluid (1 percent chromic acid 50 cc., 10 percent acetic acid 10 cc., 2 percent osmic acid 10 cc., distilled water 30 cc.). Air was pumped out of the segments when they were first placed in the fixing solution.
2. Washed 12 hours in running water.
3. Placed in 50 percent alcohol until ready for sectioning.
4. Sections cut on a hand microtome, the thickness of the sections ranging from 60 to 70 microns.
5. Stained 12 hours in saturated Calco Oil Blue NA in 50 percent ethyl alcohol.
6. Washed in water.
7. Mounted in Clearcol.

Since in the root the latex tubes are quite uniformly distributed in the region surrounding the xylem core, the tubes were counted in a quarter of that region and the number multiplied by 4 to get the total number of tubes in the entire cross section. The diameter of 30 tubes selected at random was obtained by the use of an eyepiece micrometer scale and these diameters were used in getting the average tube area. By multiplying the average tube area by the number of tubes, the total latex tube area was obtained. The total area of the cross section was calculated. By using the total cross-sectional area and the total latex-tube area the percentage of latex-tube area was obtained. The size of the tubes in the different regions outside

¹ Received for publication October 24, 1944. This report is based upon investigations carried on by the author between June 20 and September 20, 1943, as Bankhead-Jones Project 1K of the Botanical Section of the Experiment Station of Michigan State College.

² ARTSCHWAGER, E., and MCGUIRE, R. C. CONTRIBUTION TO THE MORPHOLOGY AND ANATOMY OF THE RUSSIAN DANDELION (*TARAXACUM KOK-SAGHYZ*). U. S. Dept. Agr. Tech. Bul. 843, 24 pp., illus. 1943.

the xylem core varied, the smaller tubes being next to the xylem core and next to the periderm, and the larger tubes in the intermediate region (fig. 1, *A*).

For studying the latex tubes in the petiole (fig. 1, *B*), basal segments 3 mm. in length were fixed. Ten leaves were selected at random from

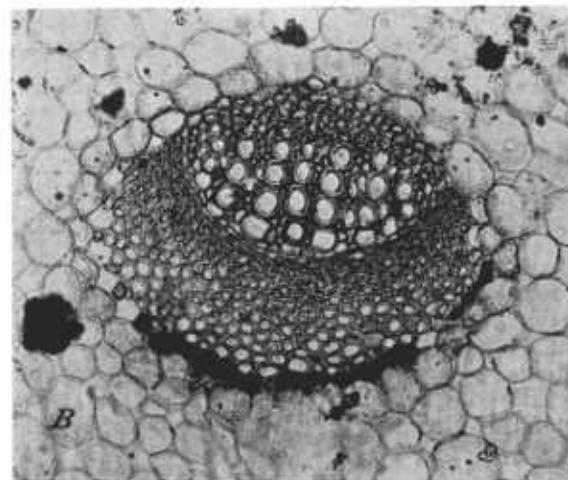
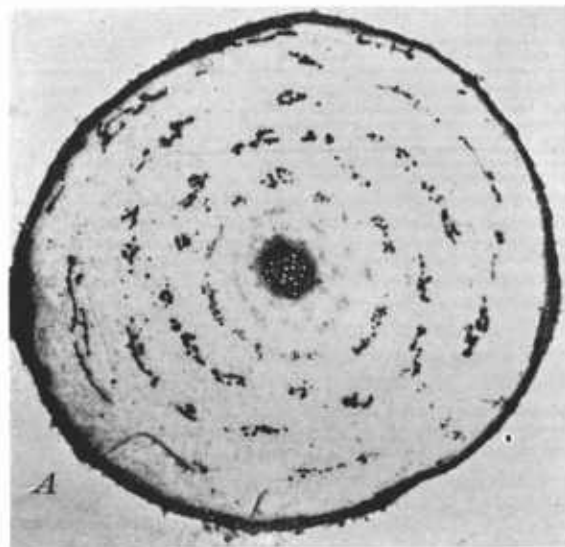


FIGURE 1.—*A*, cross section of secondary root, showing distribution of latex tubes; *B*, cross section of midvein of petiole, showing distribution of latex tube in the form of an arc along the edge of the phloem.

each plant and about 50 sections were cut from the segment of the petiole of each leaf and mounted at random on a slide. The number of latex tubes was determined in the midvein of 20 sections selected from the 50 sections. In making the selection for counting the latex tubes a mechanical stage was used. The sections were selected in sequence as they moved across the field.

PRESENTATION OF RESULTS

The results of the investigations are shown in tables 1 to 3. A comparison of the number of latex tubes in 10 leaves taken from 1 plant is shown in table 1. The percentage of latex-tube area at various levels in the primary root is shown in table 2. A comparison of the total latex-tube area in the primary root with that in its large secondary roots is shown in Table 3, and this table also shows the total latex-tube area in the 7 secondary roots arising from a primary root.

The 10 leaves from a single plant showed a marked variation in the number of latex tubes in each midvein of the 10 petioles and also at various levels in the same petiole; for example, as shown in table 1, the number of latex tubes in the midvein of the petiole of 10 leaves

ranged from 2 to 29. In similar group of 10 leaves from another plant the range was 8 to 25. In a primary root there is evident a variation in the total latex-tube area at various levels, as shown in table 2, the greatest being 31 mm. from the crown. A comparison of the total latex-tube area in the primary root with that in its secondary roots showed a marked variation; for example in table 3 the primary root had 0.16 percent latex-tube area while its 5 secondary roots had from 0.27 to 2.06 percent. Similar observations of primary and secondary roots in other Russian dandelion plants showed the following: Primary 0.84 percent, its 3 secondaries 0.71 to 1.09 percent; primary 1.35 percent, its 3 secondaries 0.43 to 1.35 percent; primary 0.96 percent, its 5 secondaries 0.6 to 1.03 percent; primary 0.7 percent, its 2 secondaries 0.76 and 0.86 percent; and primary 0.68 percent, its 5 secondaries 0.16 to 1.89 percent. In table 3 the 7 secondary roots arising from 1 primary root showed a variation in latex-tube area ranging from 0.14 percent to 1.56 percent.

TABLE 1.—*Number of latex tubes in cross section of midvein of petioles of 10 leaves taken from 1 plant*

Leaf No.	Latex tubes in section No.—																				Average	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
1	19	15	15	15	13	14	16	13	18	19	16	15	16	12	14	19	14	2	9	6	14	
2	18	11	14	17	12	16	15	13	16	20	13	16	16	18	18	17	22	17	14	11	16	
3	8	15	11	16	14	14	11	14	10	15	12	14	15	15	12	10	10	15	12	13	13	
4	13	15	15	18	19	13	20	21	11	18	16	14	19	14	14	10	18	13	13	21	16	
5	21	11	25	13	29	16	17	25	15	22	20	10	8	11	14	8	18	22	18	16	17	
6	14	14	6	10	6	19	15	21	19	12	20	13	19	22	14	17	16	10	9	8	14	
7	12	16	16	14	18	13	14	17	16	14	20	20	22	13	23	21	18	23	24	14	17	
8	21	13	15	18	20	14	18	24	22	15	18	23	21	13	14	15	16	23	22	24	18	
9	16	19	19	18	21	19	18	12	18	16	17	19	18	18	13	17	18	16	19	16	17	
10	8	8	22	17	13	12	17	22	9	21	16	9	13	19	18	17	14	12	11	10	14	
Average																						15.6

TABLE 2.—*Total latex-tube area at different levels in the same primary root*

Distance from crown (mm.)	Area of root section	Number of latex tubes	Average area of latex tube	Total area of latex tubes	Percent of latex-tube area in cross section
	a^2		a^2	a^2	
3	8, 272, 571	628	25	15, 769	0.19
6	9, 142, 798	532	33	16, 222	.18
9	8, 702, 245	544	38	20, 705	.23
12	7, 648, 457	456	31	13, 999	.18
15	6, 478, 166	564	36	20, 524	.33
18	6, 089, 522	588	44	25, 731	.42
21	6, 662, 656	556	24	13, 511	.20
25	6, 662, 656	420	28	12, 007	.18
28	6, 089, 522	476	43	20, 706	.34
31	7, 445, 858	572	69	39, 577	.53

TABLE 3.—*Total latex-tube area in the primary root and its secondary roots and in the secondary roots arising from 1 primary root*

PRIMARY ROOT AND ITS SECONDARY ROOTS

Part of root system	Area of root section	Number of latex tubes	Average area of latex tube	Total area of latex tubes	Percent of latex-tube area in cross section
Primary root.....	μ^2 18,430,888	1,828	μ^2 107	μ^2 195,925	0.16
Secondary A.....	1,461,032	196	91	17,914	1.23
Secondary B.....	13,810,857	278	166	37,734	.27
Secondary C.....	1,190,834	180	184	33,197	2.03
Secondary D.....	7,957,455	412	167	68,858	.87
Secondary E.....	2,531,917	376	138	52,046	2.06

SECONDARY ROOTS ARISING FROM 1 PRIMARY ROOT

Secondary A.....	5,190,017	504	141	81,099	1.56
Secondary B.....	7,270,815	484	138	66,826	.92
Secondary C.....	4,302,257	296	93	27,590	.64
Secondary D.....	2,228,719	252	125	31,467	1.41
Secondary E.....	3,634,303	456	125	57,091	.15
Secondary F.....	4,830,873	500	101	50,430	.14
Secondary G.....	4,302,257	364	102	36,957	.85

SUMMARY

A study of the Russian dandelion has been made to determine (1) the number of latex tubes in petioles of different leaves from the same plant, (2) the total latex-tube area at different levels in the same primary root, (3) the total latex-tube area in the primary root as compared with that in its secondary roots, and (4) that in the secondary roots arising from a single primary root.

The results of these studies fail to show any trend that would enable one to determine the total latex-tube area in a root system by examination of the primary or one secondary root of the system or one petiole of the plant.