TOTAL NITROGEN AND VITAMIN C IN OATS GROWN AT DIFFERENT LEVELS OF SOIL MOISTURE

G. R. NOGGLE

University of Illinois, Urbana

The problem of the rôle of water in the development of plants is of considerable scientific interest and economic importance. Early experiments were concerned with the growth and composition of plants in relation to irrigation practices. More recently studies have been made on the internal water economy of plants in relation to physiological development. Loehwing *(3)* found at the time of flower inception in hemp, beans and other herbaceous annuals, a rather abrupt increase in the rate of transpiration. An earlier experiment *(4)* has shown this phenomena to occur in cereal grasses. This experiment was carried out with two varieties of spring oats—Kherson and Illinois 30-2088 grown under normal long-day conditions (13-15 hours of light). Since spring oats are considered a long-day plant, the present experiment was planned to observe the behavior of spring oats under short-day conditions.

The Kherson variety of spring oats was used. They were grown under cultural conditions similar to those in the previous experiment. The pots were seeded on Nov. 17, 1941, and the soil-moisture levels were adjusted 15, 22.5, 30, 37.5 and 45 per cent. The plants received natural day light that amounted to 9-12 hours of light per day. Samples of the plants were taken periodically during the growth period and the fresh tissue was analyzed for vitamin C by titrating with 2,6-dichlorophenolindophenol *(6)*. Other samples were dried and total nitrogen determined by the micro-Kjeldahl method of Pregl *(5)*. The results given are the average of duplicate determinations. At each sampling date, several stems were dissected in order to study the morphological changes of the growing point.

The previous experiment *(4)* had indicated that under normal long growing conditions spring oats will start to joint about twenty-eight days after seeding. At the jointing stage, the internodes elongate and the growing point begins floral differentiation. In the present experiment, the jointing stage was never attained and the growing point remained in a vegetative condition. The number of leaves formed under normal long-day conditions is usually six or seven. In the present experiment ten to twelve leaves were formed by the plants grown at all moisture levels except those growing in the 15 per cent soil-moisture series which formed seven or eight leaves.

The earlier experiment had demonstrated that the jointing stage was accompanied by an abrupt increase in the rate of transpiration. The plants in the present experiment did not exhibit this abrupt rise in transpiration. Dissection of the stem and an examination of the growing point at the various sampling dates showed no flower inception.

Burd *(2)*, Bakhuyzen *(1)*, and others have shown that at the stage of flower inception, plants undergo a change in their internal water relationships. Tissue analyses indicated a lower water content and a higher percentage dry weight. This tissue dehydration is accompanied by profound chemical changes —minerals, insoluble protein, and reserve polysaccharides are mobilized. The data (table 1) for green and dry weights per plant do not show evidence of tissue dehydration noted in plants in a reproductive condition.

Total nitrogen per plant and vitamin C per plant increase during the growing period of the plant. The highest total nitrogen per plant was found in the plants growing in the soil with 30 per cent moisture. The highest vitamin C per plant was found in the plants growing in the soil with 45 per cent moisture. The best growth as indicated by green and dry weight per plant was found in the plants growing in the soil with 37.5 per cent moisture.

The data indicate that spring oats, growing at different soil-moisture levels, under short-day conditions remain in a vegetative condition, and that their tissues retain the chemical characteristics typical of the preflowering stage.

TABLE 1

	15% Soil Moisture					22.5% Soil Moisture					30% Soil Moisture				
	Green weight per plant	Dry weight per plant	Total N per plant	Vitamin C Dry	Vitamin C per plant	Green weight per plant	Dry weight per plant	Total N per plant	Vitamin C Dry	Vitamin C per plant	Green weight per plant	Dry weight per plant	Total N per per plant	Vitamin C Dry	Vitamin C per plant
	gm.	gm.	mgm.	mgm. %	mgm.	gm.	gm.	mgm.	mgm. %	mgm.	gm.	gm.	mgm.	mgm. %	mgm.
12–10–41	.24	.022	1.30	435	.0087	.25	.023	1.35	421	.0089	.25	.023	1.35	389	.0083
12–13–41	.295	.026	1.52	411	.0095	.302	.027	1.63	375	.0093	.345	.029	1.73	367	.0089
12–17–41	.322	.032	1.64	382	.0122	.385	.035	1.85	372	.0119	.45	.040	2.15	346	.0124
12–19–41	.308	.035	1.79	342	.0136	.471	.041	2.13	438	.0157	.531	.043	2.30	448	.0157
12–22–41	.284	.039	1.94	296	.0162	.544	.044	2.26	431	.0154	.667	.051	2.68	423	.0165
1–13–42	.406	.066	2.56	386	.0420	1.19	.116	4.72	390	.0461	1.508	.132	5.40	427	.0495
1–17–42	.64	.09	3.59	428	.0543	1.34	.138	5.10	390	.0556	1.77	.170	6.68	401	.0655
1–23–42	.71	.10	4.03	382	.0535	1.86	.20	6.82	381	.0821	2.33	.23	8.56	411	.0934
2– 2–42	....	....	....	...	.....	2.25	.30	9.96	318	.127	3.13	.327	11.55	402	.138

	37.5% Soil Moisture					45% Soil Moisture				
	Green weight per plant	Dry weight per plant	Total N per plant	Vitamin C Dry	Vitamin C per plant	Green weight per plant	Dry weight per plant	Total N per plant	Vitamin C Dry	Vitamin C per plant
	gm.	gm.	mgm.	mgm. %	mgm.	gm.	gm.	mgm.	mgm. %	mgm.
12–10–41	.28	.026	1.57	382	.0093	.273	.024	1.46	408	.0086
12–13–41	.338	.028	1.74	362	.0085	.336	.028	1.66	357	.0084
12–17–41	.44	.037	2.00	364	.0114	.45	.040	2.12	340	.0121
12–19–41	.53	.045	2.41	408	.0156	.555	.048	2.51	400	.0167
12–22–41	.669	.050	2.71	425	.0159	.672	.054	2.87	401	.0175
1–13–42	1.78	.144	6.25	470	.0599	1.76	.156	6.15	438	.0605
1–17–42	2.07	.194	8.04	359	.0653	1.90	.190	6.57	368	.0700
1–23–42	2.40	.233	9.18	391	.0883	2.11	.226	7.36	364	.0884
2– 2–42	3.21	.340	10.89	375	.134	2.87	.327	9.38	382	.142

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