LETTERS TO THE EDITORS

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Onset of Reproductive Phase in Grasses and Cereals

IN the Gramineae inflorescence production commences suddenly: the new primordia arising at the apex remain small but their axillary buds appear precociously and rapidly begin to develop into spikelets or groups of spikelets, according to the species. The abruptness with which vegetative growth changes over to inflorescence production suggests that there is a sort of minimum condition in the internal economy of the shoot apex which must be reached, and that once the point of balance is passed the vegetative

type of growth ceases. The obvious suggestion is that the onset of the reproductive phase only occurs when a certain carbohydrate/nitrogen (C/N) ratio is reached. If this is the case, it should be possible to alter markedly the number of leaves produced before inflorescence production by altering the nutriment in which the plants are growing. Purvis¹, however, has shown that the amount of nitrogen supplied to rye seedlings has little effect. Plants grown under long days (16 hours) and manured with a full culture solution and 1/10 N culture solution produced 13.3 and 12.4 leaves respectively if germinated at 1°C. and 21 and 20.59 leaves respectively if germinated at 18°C.

I thought that the successive removal of the laminae as they appeared might either lower the C/N ratio in the plant by cutting down the photosynthesis, or at least greatly lower the amount of food available for transport to the apex, using the term 'food' in its widest sense. It was thought that, as a consequence, the seedling might have to produce an increased number of leaves before inflorescence production commenced. As a test, grains from a single head of a pure line of wheat, *Triticum vulgare* var. *ferrugineum* Al. 'April Bearded', were sown in a large pot of good garden soil in mid-January in a cool greenhouse. (Thanks are due to Prof. Percival for original material from which the line was derived.) As the plants grew, those on one side of the pot had each successive lamina removed just above the ligular region immediately it was fully exposed. These plants could thus only photosynthesize by each developing lamina and by the sheaths left on the plant. As would be expected, the experimental plants were much smaller than the controls, as shown in the photograph taken on May 3, when most of the plants were gathered.

Although the two sets of plants differ so markedly

in size, it will be seen from the results table below that the removal of the laminae does not greatly influence the number of leaves produced before inflorescence initiation commences. Furthermore, if anything, removal of the laminae slightly reduces the number of leaves rather than increasing them as was expected. The treated plants grew more slowly, and when collected, about a fortnight before the controls would have headed, were even then about three weeks behind. The reduction in the number of spikelets from 22 to 13-14 is clearly another indication of the starvation of the plants. It may be that this last effect is not merely due to a reduction in carbohydrate production, but at least partly to a decrease in the amino compounds available to the apex from the leaves. It may easily be that the removal of the leaves has not altered the C/N ratio of the apex itself but only reduced the amount of food present.

		Number of		Highest internode with basal	
		Vegetative leaves	Spikelets	Bud	Root initials
Control	1	12	21	8	8
	2	12	22	8	8
	3	12	22	8	8
	4	12	23	8	8
Average		12	22	8	8
Laminae removed	1	11	12	7	6
	2	11	13	-	-
	3	11	14	8	8
	4	12	14	9	8
	5	12	15	8	8
Average		11.4	13.6	8	7.5

From these results, in conjunction with the observations quoted from Purvis¹, it would seem that it is impossible to make much alteration in the number of leaves which must be produced at the apex of a growing cereal like rye or wheat, either by altering the amount of nitrogen supplied to its roots or by greatly reducing its photosynthesis by the removal of large areas of assimilating tissue.

The stability of the leaf number at maturity in spite of drastic treatment is also apparent in Nutman's² study of plants grown from dwarf embryos of rye, where grains weighing only 2.3 mgm., obtained by early harvesting of the heads, gave plants with about the same final number of leaves as those grown from normal grains (about 36 mgm.).

Workers investigating the biology of cereals and grasses might well use the number of leaves on the main stem as an index of the maturity of the individual at any stage, since it seems to be more or less independent of maltreatment suffered by the plant.

Botany Department,
The University,
Leeds 2. July 21.

B. C. SHARMAN.

¹ Purvis, O. N., *Ann. Bot.*, 48, 919 (1934).

² Nutman, P. S., *Ann. Bot.*, N.S., 5, 353 (1941).

Relative Toxicity of Insecticides

THE mode of action of insecticides is still very obscure, and it often happens that their relative toxicity is largely dependent on the method of testing employed. Consequently it is difficult to compare the results of one worker with those of another.