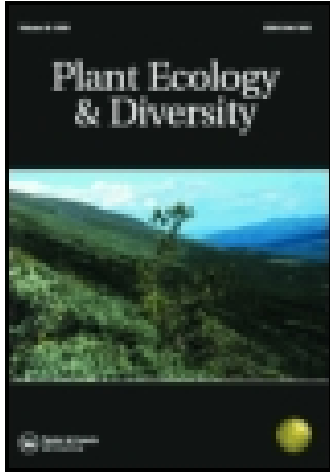


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II . Wheat and Rye Hybrids

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tagne's specimens to be .013 mm. long. Fuckel gives his measurements as .008 mm. long.

BLOXAMIA.—It has been hitherto somewhat uncertain where this genus should be placed: It appears to me that its nearest affinities are amongst the *Sticti*, probably next to *Aggrium*. The only known species is *Bloxamia truncata*, B. and Br.

II. *Wheat and Rye Hybrids.* By A. STEPHEN WILSON.

The following experiments were begun in July, 1873, for the purpose of testing whether hybrids could be produced between any two of the grasses, Wheat (*Triticum sativum*, L.), Spelt (*Triticum Spelta*), Rye (*Secale cereale*, Will.), Barley (*Hordeum distichum*, L.), and Oats (*Avena sativa*, L.), all of several varieties; or between these and Darnel (*Lolium temulentum*, L.), Wheat-grass (*Triticum repens*, L.), Wild Oat (*Avena fatua*, L.), and Fly Oat (*Avena sterilis*, L.)

The number of florets treated was between 400 and 500. And when an experimenter goes through a good deal of labour, perhaps he may be pardoned for expecting positive results. Undoubtedly the proper scientific spirit to cultivate is not to anticipate results at all. The results of the present experiments were mostly negative; but whether they were negative from unknown facts hostile to hybridisation in the florets treated, or from failure, through ignorance, to impress the proper conditions into the experiments, cannot be here determined.

Only a general description of the methods employed need be given. When a floret of wheat, rye, or any of the others, was observed to be opening, the pollen was shaken into a test tube. In other cases, when it was known that the opening was about to take place, the ear was drawn through the hand and several sets of anthers brought out at the same time, thus securing a good supply of pollen. The ears of other plants were then watched for opening florets. In most cases the anthers of these florets were removed with a pincers before discharge had taken place, and pollen from the test-tube dusted upon the stigmas with a camel-hair pencil. In many cases opening was induced at various stages before the natural date of opening. In some cases

the anthers were not removed, but only the cross pollen applied. The endeavour was made to have a certain number of experiments under all the conditions which it was thought likely would favour fertilisation. It may be mentioned that all the plants were growing in ordinary circumstances in the open air. The earlier stages, when the anthers and pollen are greenish white, were avoided, florets being mostly selected in ears which had begun to flower and in which the anthers were bright yellow or purple.

All the spikes and florets treated were marked by numbered tickets attached to them, and the conditions registered under which the experiment was made—such as what pollen was applied, whether the floret opened naturally, or was opened otherwise.

When the ears were ripe they were cut and collected for examination. Many had produced seeds, and many were barren, and many had fallen into the hands of the sparrows and were eaten up.

All that remained were put aside. Only two or three presented any abnormal appearances; they were swelled out into an unusual shape. The others were no way distinguishable from ordinary kernels of the respective grasses.

Of course it was impossible to tell whether these seeds were hybrids or not. An experiment which should detail that a cross had been effected between two wheats, because something had been produced not quite corresponding to either parent, might still be fallacious. We do not know that the removal of the anthers immediately after self-fertilisation would be without effect.

All the seeds of the various kinds were placed on damp cloth between inverted plates, in the spring of 1874, to discover which were alive and which were dead. A great many never vegetated; so that, when I came to plant my treasured hybrids, not many flower pots were sufficient for that purpose.

But the oat seeds grew up oats, and the wheat seeds grew up wheat, and the barley seeds grew up barley, and the rye grew up rye, all with the exception of the two plants, six stems of which are submitted to the Society. These are from wheat ovules and rye pollen, and the whole aspect of the culm and ear is intermediate between rye and

wheat. The elongation of the outer pales into awns midway in length between the blunt termination in wheat and the longer needle of rye is the most noticeable feature. The thinness of the culm is characteristic of rye, and so is the slight villosity below the ear, not so observable now as when green. The glumes, also, are intermediate in size between those of wheat and rye.

All the florets on these spikes fully opened, as if intending fertilisation, and on some of the ears they did not close again. But what seem to be the most important facts regarding these hybrids are, that the anthers did not open nor discharge any pollen; that the pollen was imperfectly developed and contained very little fovilla; and that the imperfect grains remain in the dried anthers. These facts are a sufficient reason why these hybrids are absolutely barren; not a single kernel having been produced. The anthers did not get blanched as empty anthers do, and instead of falling away as is usual they still remain attached, so that the imperfect pollen may be examined by breaking up an anther in a drop of water. The anthers are of the wheat size. In the ordinary fertilisation of a grass, the pollen grains continue to grow until they rupture the anther; in these hybrids this full growth of the pollen grains has been arrested.

It would be going further than caution warrants to affirm positively that the plants under notice are hybrids beyond all doubt. Whole spikes of the cereal grasses are sometimes barren, or at least remain unfertilised; and other circumstances than the transfer of the reproductive elements may have brought about the peculiar structure and the sterility of the supposed hybrids before us. But as the experimenter has considerable reason for believing these plants to be actually hybrids; and as the immediate cause of their sterility is a true and sufficient cause, and not some fancied purpose of nature; he presumes to submit his observations for what they are worth to those who may intend going further into the subject.