THE fluorescence or luminescence of seed of oat varieties when placed under ultraviolet light has currently received considerable attention as a technique for detecting varietal mixtures. A comprehensive review of work prior to 1934 on the fluorescence of seeds under ultraviolet light was presented by Chmelar (4). Gentner (7,8) was among the first to study the fluorescence of cereal crop seeds under ultraviolet light and observed that roots of germinated seeds of yellow and white oats expressed a different intensity of fluorescence. Hellbo (11) also tested different varieties under ultraviolet light and found varying reactions between white, yellow, gray and black seeded oats. In discussing different methods for detecting mixtures in seed lots, Chmelar and Mostovoj (5) pointed out that white and yellow oats could be distinguished by their differential fluorescence. Seed of Boone oats was observed by Jones (12) to fluoresce a dark bronze color under ultraviolet light, and he was unable to alter the fluorescent property of this variety by soaking the seed either in distilled water or sulfuric acid, or by several heat treatments of the seed. He also presented observations on the fluorescent reaction under ultraviolet light of 35 oat varieties.

Ultraviolet light also has been effective in detecting insect egg plugs on grain (13). Newton and Jones (14) used ultraviolet light to detect frost or low temperature injury of potato tubers, and several pathologists have used it in detecting ring rot and leaf curl infection in potatoes.

Fluorescence under ultraviolet light was used by Corkill (6) for identifying different species of Lolium. He also studied the inheritance of this character in crosses of two Lolium species and concluded that it was genetically controlled with fluorescence dominant to non-fluorescence. Woodforde (16) studied crosses of perennial and Italian ryegrass and concluded that the fluorescent character in corn has been described by Teas and Anderson (15) and by Anderson (1). They found two different genes governing fluorescence, which are recessive in studies with seedlings, but dominant in anthers.

Goodwin and Kavanagh (9) examined six species of vascular plants, representing three families, under ultraviolet light. All species observed, except six species of ferns, exhibited fluorescence. The fluorescence of oat roots was part of the fluorescence of oat seeds. In discussing the fluorescence of oat roots, they extracted the blue-fluorescing material and separated it into fractions. Later Goodwin and Kavanagh (10) identified one of the blue-fluorescing materials as the fluorescing pigment (6-methoxy-7-hydroxy coumarin). Best (2,3) previously had isolated the same compound from tobacco and potato plants.

The results presented herein were obtained at the Iowa Station from two phases of a study of the fluorescent character. A classification for fluorescence of varieties and selections of oats from the breeding nurseries is presented, and data are given on the mode of inheritance of fluorescence in segregating populations of crosses.

EXPERIMENTAL PROCEDURE

Seed of 141 varieties and selections of oat varieties under a Hanovia Inspectolite mercury arc lamp uses an EH-4 bulb and a red-purple filter as the source of ultraviolet light and emits approximately 3660 A units. Bulk seed from the Iowa breeding nurseries was examined. Seed from the world oat collection produced at the Iowa breeding nurseries. The varieties observed in the classifications made, varieties have been placed in fluorescent or non-fluorescent category. Those showing some fluorescence, however, in degree or shade of fluorescence, for example, gave a dark green to white or light gray oats fluoresced a light blue to brown fluorescence under ultraviolet light. All species observed, except six species of ferns, exhibited fluorescence. They noted that six species of vascular plants, representing 69 families, under ultraviolet light. All species observed, except six species of ferns, exhibited fluorescence. The fluorescence of oat roots was part of the fluorescence of oat seeds. In discussing the fluorescence of oat roots, they extracted the blue-fluorescing material and separated it into fractions. Later Goodwin and Kavanagh (10) identified one of the blue-fluorescing materials as the fluorescing pigment (6-methoxy-7-hydroxy coumarin). Best (2,3) previously had isolated the same compound from tobacco and potato plants.

In the classifications made, varieties have been placed in fluorescent or non-fluorescent category. Those showing some fluorescence, however, in degree or shade of fluorescence, for example, gave a dark green to white or light gray oats fluoresced a light blue to brown fluorescence among the varieties examined. All shades were grouped into the one fluorescent class and only those varieties which showed no shade of fluorescence were placed in the non-fluorescent class.

The fluorescent and rust reactions of varieties used as crown rust, stem rust, and smut differentials were used to determine the mode of inheritance of rust resistance. The results are given in table 1.

Of the 28 crosses possible among these varieties, 23 were observed. The results presented herein were obtained at the Iowa Station from two phases of a study of the fluorescent character. A classification for fluorescence of varieties and selections of oats from the breeding nurseries is presented, and data are given on the mode of inheritance of fluorescence in segregating populations of crosses.