

Air Pollution Injury (Bronzing) in Dry Beans

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Bronzing, a serious disease of Navy (pea) and Pinto bean types, is caused by the photochemical oxidant ozone. Ozone is generated by the interaction of ultraviolet light, which is a specific portion of the sun's light, on mixtures of certain hydrocarbons and nitrous oxides. These mixtures generally originate from automobile exhaust, and high ozone levels in one area may have originated many miles away in large metropolitan areas. Point sources of pollution, such as power plants and industrial factories, also contribute to the problem, but to a much smaller degree. Unlike infectious diseases which are caused by living organisms, bronzing is a noninfectious disease, and does not spread from plant to plant, or field to field.

SYMPTOMS

In Michigan, the disease is most frequently observed in mid-to-late August as the bean plants enter normal maturity. Symptoms are first observed on the lower, older leaves and consist of small dead areas on the upper leaf surfaces (Fig. 1). As the disease progresses, the necrosis extends down into the interior of the leaf, leading to necrotic lesions on the lower surface of the leaf. The leaves frequently assume a stippled appearance and lesions may coalesce to give the plants a burned or bronzed appearance (Figs. 2 and 3). The bronzing disease often appears to develop very suddenly, particularly during periods of hot, sunny weather. Other times, however, bronzing is a progressive disease, gradually affecting plants over a long period of time.



Fig. 1. Bronzing symptoms on the upper leaf surface of a bean leaf.



Fig. 2. Early stage of air-pollution damage on entire planting. Note the yellow appearance of the leaves.

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Fig. 3. Late stage of air-pollution damage showing the typical browning or bronzing of the leaves.

Fig. 4. New navy bean varieties with resistance to bronzing injury are being developed.



CONTROL

Actual losses in bean yield due to bronzing depend on numerous factors, such as plant age when the problem initially develops, presence of environmental conditions favorable for bronzing, and bean variety. In a recent 3-year study, navy bean yields were increased almost 21% when bronzing

was controlled with chemical sprays. While this points out how bronzing can reduce yields for Michigan navy bean growers, the chemical is not available commercially and, therefore, such sprays are not recommended. Additional information on how bronzing reduces yields in dry beans can be found in Michigan State University Agricultural Experiment Station

Report No. 427. New navy bean varieties with erect narrow profiles and good resistance to bronzing will be released to navy bean growers in the near future (Fig. 4). The new varieties should eliminate bronzing as a major yield-reducing problem for navy bean growers.