could not be interpreted on the one gene basis which was predicted on the
basis of field readings for root rot resistance. There was no association
between phaseolin content and substance II (the ethyl acetate extractable
phytoalexin) in these segregates. These results suggest that the genetic
controls of the induction of these substances are independent.

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NATURAL HYBRIDIZATION OF PHASEOLUS VULGARIS L. x
PHASEOLUS COCCINEUS L.

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Frequency of natural hybridization of P. vulgaris and P. coccineus
was observed in two seasons. Natural hybridization ranged from zero to
6.79%, and was dependent upon the particular parental combinations. Bumblebees
appeared to be the principal insect pollinators. The best P. coccineus
pollen parent, P. I. 223803, had scarlet flowers and was relatively early
in maturity. The P. vulgaris variety which hybridized most frequently,
Tendergreen, had a high frequency of atypical flowers. In most of the
atypical flowers the standard and/or keel petals were not fully developed,
thereby leaving the reproductive parts exposed to insect pollinators.
It is suggested that natural hybridization might be useful in transferring
P. coccineus genes for disease resistance and other characters into P.
vulgaris lines.

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SURVIVAL OF BACTERIAL PATHOGENS OF BEANS

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A. Survival in the Field

Survival studies were initiated by inoculation of a susceptible bean
variety with each of six bean bacterial pathogens (Pseudomonas phaseolicola
Races 1 and 2; Xanthomonas phaseoli; Xanthomonas fuscans; Corynebacterium
flaccumfaciens and its variety aurantiacum). Plants were harvested on
September 10, 1965 and samples were placed in sunken clay tile (4' x 1 1/2')
in which the bean straw was either placed on the soil surface or incorporated
to a depth of about eight inches.

Initially, isolations were made in September, 1965 to determine the
presence of bacteria in the straw samples. Bacteria were obtained from all
samples without difficulty because of the high bacterial content. Because of the positive results the continuance of the longevity studies appeared feasible.

Isolations from the soil and straw three months after harvest indicated that placement of infested bean straw had an important bearing on viability and pathogenicity of the six bean bacterial pathogens. Infected straw maintained on the soil surface was more favorable than when buried below the soil surface. Infested straw maintained below the soil surface eliminated some, but not all the six bacterial pathogens.

Ten months (July, 1966) after harvest and placement of infested straw, samples were taken to determine the survival of pathogenic bacteria. Straw maintained on the soil surface was more favorable for every bacterial pathogen tested. Using a disease index for rating the survival data, weight was given to the number of plants infected as well as the degree of severity. Twelve Red Kidney plants were used for each pathogen. In the same experiment, infested straw of pigweed (Amaranthus retroflexus) and lambsquarters (Chenopodium album) infested with C. flaccumfaciens var. aurantiacum and X. phaseoli, respectively gave a disease Index of 3 and 33%.

In these western Nebraska field tests, no survival after 22 months (July, 1967) in infested bean straw maintained either on the soil surface or incorporated in the soil to a depth of about eight inches was realized for the six bacterial pathogens. Survival was not realized for the same period for Xanthomonas phaseoli or Corynebacterium flaccumfaciens var. aurantiacum in straw of Chenopodium album or Amaranthus retroflexus, respectively.

The tests on field survival were repeated in western Nebraska. These studies included comparable tests in eastern Nebraska as well.

Ten months after setting up this second experiment in western Nebraska it was found that survival of bacteria was favored by placement of infested bean straw on the soil surface; incorporation of the infested straw to a depth of about eight inches was not favorable for survival. Included in this second experiment was Pseudomonas syringae which survived ten months exposure in the field. Comparable results were realized in eastern Nebraska.

In experiment No. 2, no survival was realized 22 months exposure in the field in eastern Nebraska with the possible exception of Xanthomonas fuscans. Studies on longevity for two seasons in western Nebraska indicated no survival for any of the pathogens tested.

B. Survival in the Greenhouse

In greenhouse tests, the effect of environmental factors were studied with respect to longevity of the bean bacterial pathogens for a six-weeks period. In general, dry soil (0.95% of field water-holding capacity) favored survival of all the bacterial pathogens as compared to a moist series. Air temperatures ranged from 80-120° F (comparable to midsummer
conditions). Race 1 of the halo blight bacterium did not survive as readily as the Nebraska No. 16 isolate under either the moist or air dry series. Race 1 was not recovered in the moist series for the six-week period. The orange wilt, yellow wilt, brown spot, common blight, and fuscous blight bacteria were readily recovered in the air-dry but to a lesser extent in the moist series.

C. Conclusions

The data demonstrate the importance of infested straw on the survival and overwintering and possible dissemination of several bean bacterial pathogens. Since placement of infested straw on the soil surface favors survival, plowing under and/or proper disposition of bean straw infested with the pathogens is a suggested cultural practice.

Survival of the bean bacterial pathogens in air-dry soil emphasizes the possible dissemination of the bacteria in soil mixed with infested leaf pieces or debris. Dissemination is thus possible during the growing season during dry, windy conditions or under irrigation; with the subsequent occurrence of wet periods infections can then result.

Plant parts or soil containing the pathogens could provide inoculum for bean surfaces during harvesting, threshing, and cleaning procedures. Non-host plants (e.g., weeds) may also harbor pathogenic bean bacteria and, therefore, control of the non-host plants would be an additional cultural control suggestion, as would crop rotation.

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"APOLLO" SNAP BEAN

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The garden bean variety "Apollo" was released (about 10,000 lbs. to U. S. Seedsmen), in September 1969, by the U. S. Department of Agriculture, CRD-ARS-V6ORB, Bean and Pea Investigations, in cooperation with the Washington Agricultural Experiment Station.

"Apollo" is a green-podded, white-seeded, bush snap bean, with pods borne high on the plant, concentrated maturity, and is well adapted to mechanical harvesting in the major U. S. processing areas. Maturity, yield, processing uses and quality are very similar to other white-seeded Tendercrop types. "Apollo" is resistant to all known strains of bean common mosaic virus, the Australian summer death virus, and the curly top virus. Summer death in Australia has reached epidemic proportions (with heavy losses) in recent seasons.

Resistance to curly top will not only allow the development of new bean processing areas in the west (Eastern Washington, Oregon, and Idaho);