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EVALUATION OF DISEASES OF INDIGENOUS FORAGE LEGUMES IN CENTRAL AND SOUTH AMERICA

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Most legumes under forage evaluation by the Tropical Pastures Program are native to Central and South America. In many cases, these plants are being evaluated in their natural habitats and probable centers of diversity. This seminar reviews the progress made during the past three years in understanding the problems of evaluating diseases of forage legumes in their natural habitats.

Plant centers of diversity contain the greatest natural diversity of the particular plants. The most important tropical forage legume genus Stylosanthes is native to Central and South America and plant collection information can be used to indicate probable centers of diversity of "key species". The center of diversity of S. capitata most probably exists in the region from central Brazil to the north-east of the South American continent while that of S. scabra in the states of Goias and Minas Gerais, Brazil. In contrast, S. guianensis has a very widespread distribution from Central America as far south as Argentina.



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The center of diversity of a plant is also the center of diversity of its specialized parasites (Leppik, 1970). A greater diversity of pathogenic races exists in these centers than elsewhere. Both Zhukovsky (1959) and Leppik (1970) proposed that because hosts and parasites have co-evolved in their centers of diversity every new and more virulent race must necessarily have reduced the proportion of susceptible individuals in the host population. Centers of diversity should therefore contain high proportions of resistant hosts and virulent pathogenic races.

During studies on the resistance to pathogens in small grains in their centers of diversity in Israel, both Wahl (1970) and Brodny (1973) found that 70% of the natural population of oats were susceptible to the most virulent race group of crown rust. Browning (1974) therefore concluded that in this diverse indigenous ecosystem the most virulent race group did not dominate the race population, resistant plants did not dominate the host population and susceptible genotypes and avirulent pathogen genotypes were not eliminated. These findings were contrary to what other writers proposed would happen during continuous host-pathogen co-evolution.

Diseases of indigenous legumes with forage potential were therefore studied to determine in which situations, if any, results from natural populations of small grains in Israel could be applied to natural populations of legumes in Central and South America.

Surveys of Stylosanthes spp. in natural habitats especially in Colombia and Brazil showed clearly that the widespread natural distribution of this legume genus was correlated with the widespread distribution of its most important disease anthracnose. A specific study of S. capitata was made in Brazil because its natural distribution is more accurately defined than that of other key species. From field screening studies, 24.8% of ecotypes were resistant to anthracnose at the Cerrado Center, Brazil. From seedling screening studies, approximately 30% of ecotypes were resistant to the two most virulent race groups isolated in the natural habitats of S. capitata in Brazil. These results, although preliminary and based on only a sample of available variation in S. capitata and anthracnose fungi, are strikingly similar to results documented by Browning (1974) in natural

populations of small grains in Israel.

Although epidemics are extremely rare in wild populations, diseased plants are common. How does the natural population remain stable if 70% of the population are susceptible? Browning (1974) concluded that in the center of diversity the interacting populations of pathogens and hosts are well buffered by diversity of systems of resistance -horizontal and vertical resistances, tolerance, antagonists, population resistance and the homeostatic tendencies of the pathogen population- producing the stable non-epidemic situation found in nature.

Can a system that maintains stability in the natural ecosystem be applied to the agro-ecosystem? The biggest problem is to develop a methodology that permits selection of diversity for resistance. By understanding the diversity within the anthracnose population selection for diversity in vertical resistance should be possible. By screening forage legumes in their centers of diversity it should be possible to select for diversity of resistance.

Browning et al (1979) showed that if genes for vertical resistance are wisely managed they will buffer against a diverse pathogen population in a natural ecosystem in Israel just as well as in an agroecosystem in Iowa or Texas. Results from natural populations of small grains in Israel could be applied to natural populations of legumes in Central and South America. For many scientists it is difficult to accept the naturalness of using diversity via multilines or varietal blends or mixtures to buffer host populations against shifting pathogen populations and the promise of permanent control that such diversity portends (Browning et al, 1979).