Pathology

Pigeonpea Diseases in China

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Although at present pigeonpea (*Cajanus cajan*) is not a major crop of China, it occupied an important place in rainfed agriculture of southern provinces between 1950 and 1989 mainly for lac cultivation. Pigeonpea cultivation witnessed a significant decline due to the loss of international lac market. Now the crop is receiving renewed interest in Yunnan and Guangxi provinces of China for purposes of soil conservation, fodder, and feed. During this period of the adoption of pigeonpea several plant diseases have occurred in different areas. An account of the prevalent diseases will be useful in the recent effort of popularizing pigeonpea in the country.

According to the Disease-Insect Research Group of Lac Research Institute (DIGRIRI), Chinese Academy of Forestry, nine pigeonpea diseases are prevalent in Yunnan, Guangdong, Hainan, and Guangxi provinces of China. But Shaoji (1985a) stated that in the above report the infections due to fusarium wilt caused by the variants of *Fusarium udum* were regarded as two different diseases. Also, Fuhai et al. (1985) reported that the fungus *Cladosporium* sp in fact attacks the lac insect (*Kerria lacca* Kerr.) and not pigeonpea. Thus there are only seven pigeonpea diseases prevalent in China. A brief description of these is given below.

Fusarium Wilt

Wilt caused by *F. udum* is the most important and widespread disease in lac-producing regions of China (Shaoji 1985a). The major symptoms appear as patches or a dark purple band extending upward from the base on the main stem, and blackening of xylem resulting in partial or complete wilting of the plant. In comparison to one-year-old plants, the two-year-old plants show more susceptibility to infection (DIGRIRI 1978). A survey conducted by DIGRIRI in 1978 showed 15–90% wilt incidence in Jingdon. It was also reported that the plants on which the lac insects were reared or which were excessively exposed to the insect, exhibited relatively more wilt incidence than those plants which did not have the lac insects.

Phytophthora Blight

Plants infected with phytophthora blight, caused by *Phytophthora drechsleri* f. sp *cajani* showed water-soaked lesions on leaves, and brown to dark, or grayish white and sunken-shaped lesions on stems and petioles. The base of the main stem and branches, especially pruned branches were more susceptible to this disease. Under conditions favorable to the pathogen, it causes severe damage. The disease prevails in almost all the lac-growing regions in China, but the losses due to phytophthora blight are more in hot, arid areas. Infection usually sets in only at the beginning of the rainy season and develops rapidly in hot weather. Phytophthora blight was found to be severe in Daolie forest land of Hainan island (DIGRIRI 1978).

Powdery Mildew

Powdery mildew (*Oidiopsis taurica*) is an important disease of pigeonpea in China (Shaoji 1985b). It occurs throughout the year, but is more severe during the rainy season. In Jingdong, generally two peaks are observed one from late February to early May and another from early October to late December (Shaoji 1985b). In Xichang and Sichuan the disease is prevalent from April to June (Xinqiao 1976). The initial symptoms develop as small yellowish white spots on the leaf surface, followed by white powdery patches, and finally blackening of the surface. The disease causes shortening of top young branches, upward clustering of young leaves, and stunted growth of plants. Flowers and pods are also infected and result in the reduction in pod set. Seedlings are susceptible to powdery mildew if exposed alternatively to drought and humidity.

Sterility Mosaic

Sterility mosaic infected plants do not flower and pod. The disease causes stunted plant growth. The initial symptoms are vein-clearing in the younger leaves and in

Table 1. Suggested measures for controlling pigeonpea diseases in China.

Measures	Details	Diseases
Cultural practices	- Use adequate plant ash, and small quantity of manure or superphosphate as base fertilizer.	All diseases
	- Maintain appropriate spacing while seeding and thinning.	
	- Follow crop rotation and intercropping.	
	- Prepare ridges and furrows to prevent waterlogging.	
	- Burn plant debris every year.	
	- After each pruning, spray or smear the cut with 1% Bordeaux mixture.	
Host plant resistance	- Introduce cultivars resistant to diseases or select seed from healthy plants in local sick-fields.	
Chemical control	- At initial infection stage, spray and smear lesion with 0.5% mixture of lime and sulfur or sublimate @ 0.1–0.2%.	Phytophthora blight
	- Seed dressing with 1:1 mixture of 0.3% Seris and 6% Benzex.	Fusarium wilt; also prevents seedling damping off and other soil pests
	- At initial infection stage, spray wettable or dusty sulfur 1–2 times; spray mixture of lime + sulfur @ 3–5%; or spray thiophanate @ 0.1%.	Powder mildew and cercospora leaf spot

localized areas on the leaves of older plants. After October, some plants were found to recover to some extent. The disease is frequently accompanied with powdery mildew. The older plantations exhibit high degree of sterility mosaic and powdery mildew (DIGRIRI 1978).

Cercospora Leaf Spot

Lesions of *Cercospora* spp appear as circular or small irregular brown spots on leaves. Cercospora leaf spot may cause defoliation under severe pressure. Plants infected with *Cercospora* are more prone to attack by other pathogens. The disease is common and its incidence is high, particularly during rainy season (DIGRIRI 1978).

Rust

Rust is caused by *Uredo cajani.* Typical dark brown pustules are present on the lower surface of leaves of the infected plants, giving an appearance of yellowish brown spots. The disease is prevalent only in some areas of China (DIGRIRI 1978).

Phoma Stem Canker

Phoma stem canker is caused by *Phoma cajani* and is observed in Jingdong. It generally occurs in adult plants and is characterized by the appearance of brown, cankerous lesions on the stem. The lesioned portions often develop swellings in old and perennial plants. This disease assumes importance in China in view of the future adoption of pigeonpea as a short perennial crop for soil conservation.

Control Measures

The control measures used in China are based on the theory of improving plant health to build up its resistance. Major disease control measures reported in Chinese literature by DIGRIRI (1978), Shaoji (1985a, 1985b), and Xinqiao (1976) are summarized in Table 1.

References

DIGRIRI (Disease-Insect Research Group of Lac Research Institute, Chinese Academy of Forestry). 1978. The kinds of pigeonpea diseases and the preliminary control measurement. Developing Status of Lac Production 2:5–8.

Fuhai, Z., Xianren, Z., and **Fudi, F.** 1985. The damage and control of dark mildew (*Cladosporium* sp.). Pages 115–121 *in* Papers collection of Lac Research Institute of Chinese Academy of Forestry, 1955-1985.

Shaoji, G. 1985a. Study on pigeonpea wilt disease. Pages 122–124 *in* Papers collection of Lac Research Institute of Chinese Academy of Forestry, 1955-1985.

Shaoji, G. 1985b. Study on control of pigeonpea powdery mildew. Page 200 *in* Papers collection of Lac Research Institute of Chinese Academy of Forestry, 1955-1985.

Xinqiao, L. 1976. Control of powdery mildew of pigeonpea. Newsletter of Forestry Science and Technology of Sichuan 4:22.2.

Reaction of Pigeonpea Accessions to Root-knot Nematode *Meloidogyne incognita* and Reniform Nematode *Rotylenchulus reniformis*

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Pigeonpea (*Cajanus cajan*) is a widely grown pulse crop in India and is an important source of vegetable protein. The woody stem residues have great potential as a substitute to the ever increasing demand for solid fuel. The combustibility or energy output from woody plant wastes of pigeonpea depends on its bulk density (Jain et al. 1986). The root-knot nematode *Meloidogyne incognita* (Kofoid and White) Chitwood and reinform nematode, *Rotylenchulus reniformis* Linford and Oliveira have been found consistently associated with plant damage, and reduced biomass and grain yields of pigeonpea. Resistant varieties have been suggested for crop protection

Table 1. Reaction of pigeonpea accessions to root-knot nematode *Meloidogyne incognita* and reniform nematode *Rotylenchulus reniformis*.

Reaction	*Meloidogyne incognita*	*Rotylenchulus reniformis*
Resistant	KA-3	KM-137
Moderately resistant	KM-137, KM-138	KM-138
Susceptible	Pusa(B)25, Pusa(B)27, Pusa(B)34, Pusa-988, P-981, P-982, P-986, MAL-8, MAL-9, MAL-10, MAL-11	KA-3, MA-3, MA-4, MA-6, MA-7, MTH-9611, MTH-9613, MTH-115, P-981, P-982, P-986, Pusa(B)27, Pusa(B)34, Pusa(B)25, Pusa-988
Highly susceptible	AF-345, AF-2039, AL-1340, AL-1381, DPA-92, H-88-22, H-88-25, H-91-23, IPA-95-1, KF-108, KSMR-8, MA-3, MA-4, MA-6, MA-7, MTH-9611, MTH-9613, MTH-115, TAT-9802, TAT-9803, WRG-14, WRGE-11, WRGE-1178	AF-345, AF-2039, AL-1381, AL-1340, DPA-92, H-88-22, H-88-25, H-91-23, KF-108, KSMR-8, MAL-8, MAL-9, MAL-10, MAL-11, IPA-95-1, TAT-9802, TAT-9803, WRG-14, WRGE-11, WRGE-1178