

YELLOW STRAP LEAF, A NEW DISEASE OF FLORIDA PAPAYAS¹

ROBERT A. CONOVER

IFAS, Agricultural Research and Education Center,
University of Florida,
18905 SW 280 St., Homestead, FL 33031

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Abstract. Yellow strap leaf is a recently discovered physiological disease of papayas with striking symptoms which include yellowing and narrowing (strapping) of leaf lobes, shortening of petioles, internodes and staminate inflorescences. Petals are so narrowed that ovaries are exposed even on immature flowers. Fruit remains on the plant but after symptoms appear fruit set ceases. Affected plants may recover spontaneously and the problem may recur on recovered plants. Observations and experiments indicate that yellow strap leaf is very similar to yellow strap leaf of chrysanthemum in its cause and occurrence.

A new disease of papaya with striking symptoms was observed in Dade County plantings during the summer of 1978 and 1979. The symptoms are similar to those of yellow strap leaf of chrysanthemum and the disease occurs in about the same circumstances. Because of the similarities, "yellow strap leaf" (YSL) is the name proposed for this new papaya disease. This paper describes this new physiological disease and presents results of experiments which show that its etiology is very similar if not identical with the cause of YSL of chrysanthemum.

Yellow strap leaf of chrysanthemum was described by Jackson and Woltz in 1959 (1). Symptoms included yellowing, narrowing or strapping of leaf blades, rolling of margins and leaf tips, short internodes and severe retardation of new growth. Occurrence of the disease was associated with warm weather, high rainfall and conditions favoring retention of soil moisture. Woltz and Jackson (3, 4) were unable to transmit the disease and reported that it was not due to herbicides or fungal, viral or bacterial pathogens. The disease was not corrected by application of inorganic nutrient elements. Woltz and Littrell (5) showed that the ubiquitous soil-inhabiting fungus, *Aspergillus wentii*, produced a toxin under certain conditions which was absorbed by and acted within the plant as an antimetabolite of leucine. Woltz demonstrated that this toxin was capable of producing stunting and morphological changes of at least 4 other plant families (2).

Symptomatology

Papayas in a planting affected by YSL are usually clustered with plants near the centers of affected areas showing more severe symptoms than marginal ones. Symptoms on individual plants range from a slight yellowing to the severe symptoms described below.

The earliest symptom of YSL is the development of a pale yellow color in new leaves which becomes more intense particularly near leaf margins. Major veins are bordered by bands of green tissue with diffuse outer margins. Laminae are narrowed and strap like in severe cases. Lobe tips, which seem elongated due to narrowing of the lamina, are hooked downward or laterally toward the midrib (Fig. 1).



Fig. 1. Lobes of papaya leaves: affected by yellow strap leaf (left); healthy leaf (right).

Leaf area is also much reduced and new leaves emerging from the bud are clawlike and fail to expand. Petioles are progressively shorter towards the stem tip and become stiff and brittle. Internodes are very short on severely affected plants but stem diameter is unaffected. Short stubby branches may develop in profusion giving the plant a bushy appearance. Foliage on these branches have the same symptoms as terminal leaves (Fig. 2).

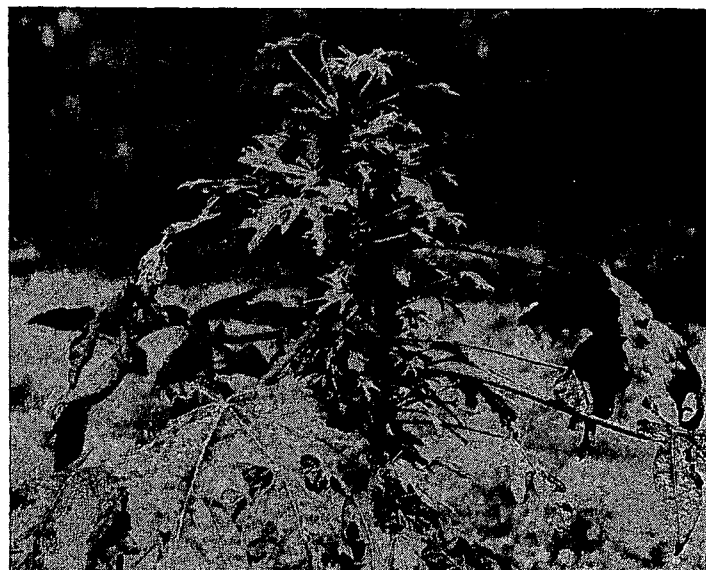


Fig. 2. Papaya plant showing symptoms of yellow strap leaf.

Flowers on severely affected plants are unusually numerous but they do not develop normally and do not set fruit. Petals are so short that they barely cover the pistil and

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so narrow that the ovary is exposed. Fruits do not abscise or enlarge. Staminate inflorescences are progressively stunted towards the stem tip, maturation of flowers is delayed and the few that open are small and bear no pollen.

Some plants recover spontaneously from YSL by resumption of normal growth but symptomatic leaves remain on the plant for many weeks. Recovered plants may develop the disease again at a later date.

During the past 2 years YSL has appeared in June during hot, rainy periods especially where short periods of flooding occurs after heavy rains. It has occurred in plants growing on raised beds covered with plastic mulch as well as plantings on level land. Plants have recovered during dry periods and YSL has recurred during subsequent wet periods. It has not developed or recurred during late fall and winter but some affected plants have displayed symptoms throughout this period.

Experimental Reproduction of Yellow Strap Leaf

Examination of affected papayas in the field revealed no signs or symptoms of a pathogenic disease either above or below ground. Since symptoms of YSL and circumstances of its occurrence are similar to those described for YSL of chrysanthemum an experiment was designed to test the hypothesis that the two diseases have a similar cause.

Soil was obtained from near the roots of papayas affected by YSL. Part of this was used without treatment and part was used to "inoculate" potting soil. Half of these soils were pasteurized with aerated steam at 170°C for 1.5 hr. These soils together with untreated potting soil were placed in 8" plastic pots and two 6" papaya seedlings were transplanted into each pot. "Wet" soil was provided by placing the pots in 9" pie pans which were filled with water twice daily. When full water stood about 25 mm above the base of the pot. Plants in "dry" soil were provided with good drainage and watered by hand as needed to maintain active growth. These treatments are summarized in Table 1. Each treatment was replicated 4 times.

The experiment was started on July 18, 1978. Initial symptoms of YSL were evident 7 days later and severe symptoms 15 days later. YSL developed in untreated YSL-soil and in the mixture of YSL and potting soil but only when these

Table 1. Development of yellow strap leaf of papaya as affected by soil type, pasteurization and soil moisture.

Soil treatment and moisture level	YSL soil	YSL soil + potting soil	Potting soil
None			
wet	X ^z	X	0
dry	0	0	0
Pasteurized			
wet	0	0	
dry	0	0	

^z"X" indicates YSL developed; "0" YSL did not develop.

soils were wet. YSL did not develop in pasteurized YSL-soil or in any dry soil treatment (Table 1).

The experiment was repeated in 1979 with identical results except that YSL developed 13 days after the moisture regimens were begun.

Discussion

The results of experiments to reproduce YSL indicate that the cause of the papaya disease is very similar to the cause of YSL of chrysanthemum. Symptoms of the diseases are similar, both occur in the field and are reproduced experimentally in very similar situations. This evidence strongly supports the hypothesis that YSL of papayas and chrysanthemum have a common etiology.

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THE GENUS SPONDIAS IN FLORIDA

JOHN POPENOE

Fairchild Tropical Garden,
10901 Old Cutler Rd., Miami, FL 33156

Abstract. At least 6 species of *Spondias* (family Anacardeaceae) have been tried in Florida. Two species, *S. cytherea* and *S. purpurea* are of horticultural value to South Florida for their edible fruit. A number of cultivars of *S. purpurea* are grown which mature at different times from May to October. Cultivation is restricted to the warmest parts of the peninsula and the Keys because these species are very sensitive to frost. The species are adapted to well drained soils and are highly tolerant of drought.

The genus *Spondias* belongs to the Anacardeaceae or cashew family. Other members of this family include the mango and poison ivy. The genus consists of about 8 to 10

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species of the tropics of Asia and America. Of these species at least 6 have been tried in Florida. The fruits of some of these species constitute an important source of food in areas where they are native.

At least one species of *Spondias* has been cultivated in Florida for 140 years. We have a report of the hog plum growing in the Florida Keys in 1839 (1). Both *Spondias mombin* and *S. purpurea* sometimes go by this name. Since that time there have been many introductions and sporadic cultivation of the three major species in the warmer parts of the state and the Keys. Although *Spondias purpurea* is locally popular, the fruits have never become important even as dooryard trees. Their wide adaptability to our soils and climate indicate that they should be more popular where frost is not a problem.

The present study is based primarily on the trees growing at the Fairchild Tropical Garden and the Montgomery