tall, 165 cm wide. It is ideal in entrance gardens for light industry, as specimens and shrub borders.

'UConn' (Fig. 4) is an intermediatesized white pine that is dense and fastgrowing. It has attained a height of 3 m and a diam of 2.6 m in 12 years. Its dense growth may be attributed to its habit of developing up to 7 new shoots from each terminal cluster of buds. The needles are Spinach Green (0960/2), 6 cm long, and are retained for 2 years. The broad pyramidal form of this clone suggests its use in industrial plantings and as a background to highlight flowering trees or shrubs. It is highly functional when used for climate control, windbreaks, privacy, highway median strips and barriers to noise or unpleasant views.

#### Availability

Scions of these clones have been released to cooperating Connecticut wholesale nurserymen for evaluating the potential of these and other clones for commercial production. This limited distribution will be maintained until sufficient stocks become available for general release.

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# I.T.-9 and I.T.-18 Rose Rootstocks<sup>1,2</sup>

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Although roses have been propagated by grafting for more than a century, there has been relatively no concerted breeding effort to develop rootstocks (understocks) as has been done for rosaceous fruit crops. Selection of cultivars, both asexually and sexually propagated, that have been used for propagating roses has come about so far more by fortuitious circumstance than by design. A survey (1) of rootstocks used in rose propagation indicated that the largest number were derivatives of either the Caninae or the Synstylae tribes, with the Caninae being more prevalent in Europe and the Synstylae in the U.S. Also, the survey delineated those qualities desired as well as those in which the commonly-used rose rootstocks were deficient. Characteristics found lacking were root flexibility, a trait of importance to to all nurserymen packaging rose plants either for sale or shipment, tolerance to low soil temp, and resistance or tolerance to soil-borne pests such as nematodes.

The rootstock breeding program, from which I.T.-9 and I.T.-18 were derived, was designed to retain ease of

propagation, relative foliar disease resistance, wide scion compatability range, and productivity of the rootstocks in current commercial use as well as to increase root hardiness and flexibility and, if possible, to increase tolerance to soilborne pests. The breeding program was based upon the species contained in the tribe Synstylae, primarily because these species contain the traits that American rose nurserymen consider best adapted to a wide range of soil and temp conditions and to current production techniques. In addition, the Synstylae are relatively easy to propagate by hardwood cuttings which reach a size suitable for grafting in one season.

The names for these rootstocks are the initials of the states cooperating in this program, Iowa and Texas, plus the number by which these selections were identified during the trial period.

#### Origin

The pedigree of I.T.-9 and I.T.-18 is presented in Fig. 1.

#### Description

*I.T.-9.* The plant is vigorous, erect, later arching, to a height of 2.5m and 2.5m wide, hardy to  $-35.5^{\circ}$ C. The canes are medium green, RHCC138B, (3) and thornless. The foliage is pinnately compound, with 7-9 leaflets varying in size with the vigor and age of the plant, medium green (RHCC138A). The leaflets are leathery, slightly rugose, and glossy. Flowers are small, 2cm in diam, single, white. The fruit is globular-ovoid 0.5cm in diam, dark vermilion red (RHSCC44A).

I.T.-18. The plant is arching to 2m



Fig. 1. Pedigree of I.T.-9 and I.T.-18 rootstock.

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high and 2m broad, vigorous; hardy, showing no winter damage to mature canes, to 35.5°C. The canes are thornless, although vigorous canes produced in late summer may have a few scattered prickles. The bark on the canes is Iris Green (RHSCC147C), taking on red tones in late summer and early fall. The foliage is pinnately compound with 7 leaflets that are slightly rugose, glabrous. The foliage is medium green (RHSCC137B). The flowers are pale pink in the bud stage, opening white. The globular scarlet-red (RHSCC44B) fruit is 0.5cm in diam and is borne profusely.

Both I.T.-9 and I.T.-18 resemble Rosa multiflora in all other respects.

#### Adaptation

Evaluation of these rootstocks was done primarily in Iowa and Texas, although observation plantings were made in California, Oregon, Wisconsin, and Massachusetts. In the trials conducted in Texas, the scion cultivar was 'Peace'. Compatibility trials in Iowa were more extensive and involved a range of cultivars covering the spectrum of garden roses. The range of scion compatibility is equivalent to that of the rootstock cultivars in current use. It was observed in Texas and Iowa that both rootstocks were unusually resistant to rose blackspot (Diplocrapon rosae wolf) and had moderate resistance to powdery mildew (Sphaerotheca pannosa var rosae wor).

A comparison of I.T.-9 and I.T.-18 over a 6-year period with some commonly used rootstocks in the East Texas rose producing area is presented in Table 1. Root system of these understocks are shown in Fig 2 and 3.

The ability to survive sub-zero winter is not important in the major rose-producing centers, but is over much of the northern half of the U.S. The canes of both rootstocks have survived repeated exposures to  $-35.5^{\circ}$ C, both in the same winter and in successive years. During the winter of 1976-1977, the roots of I.T.-9 and I.T.-18 and their common parent, Iowa 62-5, survived soil temp during 3 different exposures of  $-11^{\circ}$ ,  $-10^{\circ}$ , and  $-9.5^{\circ}$  at 20.5cm (8 inches). They were the only understocks to survive (2).

In current nursery practice, hard-



Fig. 2. Root system of I.T.-9.

Fig. 3. Root system of I.T.-18.

Table 1. Comparison of I.T.-9 and I.T.-18 with commercial rose rootstocks, 1971-1977.

|              |                        | Rating <sup>z</sup>       |                    |                     |                           |                        |                      |
|--------------|------------------------|---------------------------|--------------------|---------------------|---------------------------|------------------------|----------------------|
| Rootstock    | Cutting<br>rooted<br>% | Marketable<br>plants<br>% | Cutting production | Root<br>flexibility | Amoun<br>of root<br>fiber | t<br>Root<br>hardiness | Foliage<br>retention |
| I.T9         | 97.6y                  | 80.6y                     | 4                  | 5                   | 4                         | 5                      | 3                    |
| I.T18        | 98.8                   | 80.6                      | 4                  | 5                   | 2                         | 5                      | 4                    |
| Iowa 62-5    | 97.0                   | 74.8                      | 3                  | 5                   | 3                         | 5                      | 3                    |
| Brooks 56-6  | 95.2                   | 79.0                      | 4                  | 4                   | 3                         | 3                      | 3                    |
| Welch 59L-1  | 88.7                   | 63.4                      | 1                  | 5                   | 2                         | 2                      | 3                    |
| Atwood 56L-1 | 92.7                   | 72.6                      | 3                  | 3                   | 2                         | 3                      | 4                    |
| Ginn         | 91.0                   | 68.4                      | 4                  | 3                   | 3                         | 2                      | 3                    |

<sup>2</sup>Rated on a scale of 1-5, 1 = poor, 3 = overall, 5 = desirable. <sup>y</sup>Differences not significant.

wood cuttings for the next crop are taken in late fall from cuttings rooted the previous winter and budded the following summer. It is desirable therefore, for the young plant to develop a compact bushy habit producing long canes with straight internodes and axillary buds with shallow bases. This last trait facilitates removal of the excess buds and inhibits the production of sucker growth from the understock. I.T.-9 and I.T.-18 are both adapted to this nursery practice.

#### Avaiability

I.T.-9 and I.T.-18 will be available upon request in the form of budwood or hardwood cuttings during the summer and fall of 1978. Requests for propagating material should be sent to the author.

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