Study I with *Acer* and *Forsythia*. However, leaf chlorosis was frequently observed in the 12 lb. dichlobenil treatments in all species. Response of *Acer* and *Forsythia* is presented in Table 1.

Uniform plant responses were obtained from activated carbon treatments of Studies I, II, and III regardless of the dip concn. Differences between activated carbon treatments as a 10% slurry, 20% slurry, and a dry powder dip could not be detected at individual herbicide rates. No response to activated carbon treatments were observed in the control plots.

These studies are in agreement with those of Ahrens (2, 3) who reported a general reduction in dichlobenil injury to woody plant materials through the use of a dry powder dip at planting. Treatment of the root systems of young nursery materials with activated carbon at planting prevented or reduced dichlobenil toxicity during the ensuing growing season. Activated carbon dips as a 10 or 20% water slurry and dry powder were equally effective in reducing plant injury.

Ahrens (3) has suggested that plant protection from herbicide toxicity, through the use of activated carbon dips, is possible only where a small margin of safety is desired. Robinson (10) reported a reduction in simazine injury to strawberries only at herbicide rates normally applied to established plantings. In the studies of 1967-68, it was observed that injury as leaf chlorosis and curling was the first indication of dichlobenil toxicity, and this injury preceded detectable suppressions in plant growth. Herbicide levels, at which visual injury was pronounced, were considered to be the limit of plant protection provided by the dip treatments.

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Repetitive Flowering from a Single Floral Axis in Camellia[1]

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Abstract. **An unusual flowering phenomenon has been observed for 4 consecutive years on an unnamed *Camellia japonica* clone, PI 276119. While many faded blossoms dropped from the plants, others remained firmly attached. The inner portion of the tightly folded center of each persistant faded blossom remained pinkish-white. These centers expanded and were similar to emerging flower buds except they did not have bud scales. Elongation of the old flower axis placed the new bud slightly above the old flower. Following a resting stage of 6 weeks to about 4 months, new blossoms developed on the same axis and directly above the old flowers. During the 1970 season as many as 3 successive blooms were observed one upon the other.**

The physiological aspects of this phenomenon are contrary to normal flower bud development in camellia. Repetitive flowering from a single floral axis appears to violate the principle of determinate growth of flower buds.

An unusual flowering phenomenon has been observed for several years at the U. S. Plant Introduction Station, Glenn Dale, Maryland, on one of our *Camellia japonica* L. introductions from Japan. A literature review did not disclose a similar flowering pattern in camellia or in related ornamentals. It would be of interest to know if this particular behavior is indeed unique, or whether it has been observed on other plant species.

In 1961, cuttings of an unnamed *C. japonica* clone, PI 276119, were received at the station among other plant introductions collected by J. L. Creech, USDA plant explorer, at the Matsumae Castle Gardens, Matsumae, Hokkaido, Japan. This camellia was described in the collector's notes as having pink, double flowers. Local Japanese authorities claimed that the clone had been brought from Kyoto about 200 years ago.

The plants first flowered in greenhouses at Glenn Dale in 1965 and were described as formal double of perfect symmetrical form, 6 1/2 cm across, shell pink border petals fading to near white at the center, Fig. 1. The flowers very closely resemble 'Pink Perfection' or more exactly the sport of this variety, 'Pink Pearl' The buds from which these flowers were produced were entirely normal in appearance with normal bud scales. At no time were sexual elements observed, either outwardly or by dissection. At full flower expansion a center remained of tightly folded petals, 7 mm diam, as shown in Fig. 1.

Toward the end of the normal blossoming season in 1966, an odd flowering behavior was first noticed. Faded blossoms gradually turned brown and many dropped from the plant, but others remained firmly attached. The inner portion of the tightly folded center of each of the persistant faded blossoms remained pinkish white as detected by dissection. These centers rapidly expanded in size to about 1.5

Fig. 1. Normal blossom of PI 276119 *Camellia japonica.*

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cm diam, and had all the appearances of emerging flower buds with one exception, they did not possess bud scales. With the expansion of the emerging flower bud the old flower axis elongated, which placed the new bud slightly above the withered petals of the old flower. Fig. 2 shows a frontal view of a faded blossom with a flower bud protruding through its center. Fig. 3 shows a side view of a bisected faded flower and central bud. Following an apparent resting stage varying from 6 weeks to approximately 4 months, these buds developed into blossoms directly above the old withered flowers, Fig. 4, as a continuation of the same axis. The sequence of events between full bloom of the first set of flowers to that of the second series, stage shown in Fig. 4, takes from 2 to 5 months. This flowering behavior has now been observed for 4 consecutive years. During the 1970 season several individuals were observed where 3 blooms developed one upon the other.

Under greenhouse conditions, PI 276119 begins its first series of flowers in early November, and continues to bloom until February. This is comparable to many other clones of *C. japonica* grown under similar conditions. The second and third series of flowers extends the blooming period until late August. These "out of season" flowers mature during very hot summer temperatures, and are small, poor quality blossoms compared with second series blossoms of early spring.

Flower bud differentiation in camellia normally takes place during the long days and high temperatures of the summer, with each bud producing one flower. Flower development and maturation among outdoor plants takes place in *C. sasanqua* Thunb, during shorter days and cooler temperatures of autumn, while in *C. japonica* the flower buds over winter in the resting stage and mature the following spring. Under greenhouse conditions flowering is advanced to early winter for *C. japonica.* Flower buds were well differentiated on plants of PI 276119 by mid-July 1970. Sections were made in late July and observed under the microscope for the possible presence of multiple flower initials. No conclusive evidence was found to indicate that more than one flower initial existed in each bud. Thus, multiple flower bud initials do not seem likely. Instead it appears that a single flower bud is capable of producing a series of separate blossoms at intervals along an elongated central axis.

Fig. 2. Frontal view of a faded blossom with a flower bud protruding through its center.

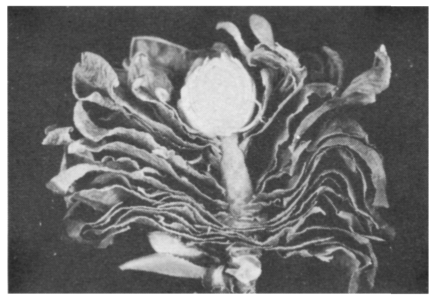

Fig. 3 Side view of bisected flower and central bud.

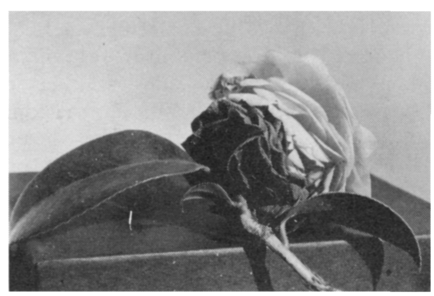

Fig. 4. Fully matured blossom directly in front of an old withered flower.

For an ornamental, this peculiar flowering habit is by no means desirable. The retention of old withered flowers is unsightly and detracts from the attractiveness of the second series of blossoms. This behavior, however, is so different from the flowering of other *C. japonica* clones that it seems worthy of report. The physiological aspects of this phenomenon are contrary to normal differentiation and maturation of camellia flower buds. The succession of blossoms from a single flower bud appears to violate the principle of determinate growth of flower buds as contrasted to the indeterminate growth of vegetative buds. The explanation of the mechanism which triggers this "periodic flowering" can only come from further investigations.

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