Panel on Taxus Propagation

FRIDAY MORNING SESSION

December 3, 1954

The session convened at 9:30 o'clock, President Chadwick opening the session.

PRESIDENT CHADWICK: As the result of the survey that was sent out regarding the program this year, one of the topics most frequently specified was *Taxus*. The decision was reached that perhaps we would go a little bit further than simple propagation in one sense of the word, at least, on this group of plants, and carry on through to at least the first stages of field production. Consequently, the program has been set up in that way and it is going to start from the beginning and go on through field production, covering seeds and cuttings and other methods of plant propagation.

The moderator in charge of the session this morning is Professor Ray Keen, Department of Horticulture at Kansas State College.

If you want to know anything about identification of *Taxus*, see Ray. Don't talk to me. I am just the guy who tells him what to do, but Ray is going to head up this session, and I am sure you are going to be interested in it. We hope we will have as good a discussion following the papers as we did yesterday. So I will introduce Ray Keen at this time.

Mr. Ray A. Keen took the chair.

MODERATOR KEEN: Thank you, Dr. Chadwick.

Mr. President, and fellow propagators: It is really a pleasure for me to come before you this morning and present this review of the propagation of *Taxus*. Chad, I am very glad that I can run back and forth between Kansas State and Ohio State, because, had I been at Ohio State, I am sure I would have closer to 1,000 papers to review than 100. Even though we live far beyond the range where taxus grows, commercially at least, we had a goodly number of papers to choose from in presenting this paper.

Mr. Keen presented his paper, entitled "The Propagation of *Taxus* — A Review." (Applause)

THE PROPAGATION OF TAXUS — A REVIEW

RAY A. KEEN

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Taxus are commonly propagated by seeds and cuttings, a few varieties by grafting, and occasionally an amateur will propagate a plant by layering.

Seeds are used to propagate the species of yew and are preferred by many growers, according to Wells (34) and others (12, 21, 28), for producing the excurrent "capitata" form of the Japanese Yew, *T. cuspidata*. Hatfield (12) and Wells (34) have pointed out that the source of seed is important, since the yews hybridize readily, and seed from a mixed nursery planting may offer many potentially excellent new varieties. However, commercially, a block of such plants must be sold as "mixed seedlings . . . . and do not command a high price on the market", according to Wells (34). It was my privilege to observe several such blocks of stock, of all ages, this past summer. From them plants could be selected to fit the description of almost any of the yews in the literature except, possibly, *T. baccata adpressa*, the Shortleaf English Yew. Wells (34) prefers domestic seed, from nursery stock plants, to imported seed. The seed should be gathered as soon as ripe and cleaned by "macerating the arils in water and floating away the pulp and empty seed" (35). Yew seed remains viable up to four years if stored in moist peat below 40°F.

Yerkes (36), Bailey (2) and others (7, 12, 28, 35) classify yew seed as "two year seeds" which are stratified as soon as procured and planted the following spring. Germination occurs one year later. Sheat (28) recommends 15 to 16 months stratification, from the time the seed is gathered in the fall until March of the following year. Fall planting is preferred to stratification by Yerkes (36).

Crocker (7) classed *T. cuspidata* with seeds having a resistant seed coat, which require 90 days at 68° F. under good germinating conditions to permit soil organisms to break down the seed coat and moisture to enter the seed. This warm treatment is followed by 120 days at 34° to 41° F. to afterripen the seed. It will then germinate. Sulfuric acid was not effective in overcoming the seedcoat factor. The author of the article on *Taxus* in the Woody Plant Seed Manual (35) suggests several possible treatments for taxus seed but points out that, "Satisfactory methods for laboratory germination have not yet been worked out."

This should be a fertile field for scientific investigation, for it has been my observation that the embryo in the seed of *Taxus* is too small to germinate at the time the seed is collected. If this is true it would explain the necessity for a warm period, before afterripening of the seed, which cannot be replaced by acid scarification of the seed coat.

The seedlings are removed to transplant beds at the end of one (36) or two (34) growing seasons. They are field liners at the end of two seasons in the transplant beds.

The literature on propagating taxus from cuttings is abundant since taxus was included in much of the early work with growth substances (4), (8), (13). Prior to the general use of root accelerating substances taxus cuttings required six to nine months to root, and Bailey (2) allowed 12 months. Oliver (25) reports 60% rooting of untreated cuttings after six months.

Chadwick (4) found sand alone and peat alone to be better mediums than sand-peat mixtures. Durham (9) had best results in peat-sand and peat-cinders mixtures. Esper (10) and Chadwick (4) found that the results with different mediums changed as the season progressed. The conclusion was reached that the varied results of other workers was due, in part at least, to the time the cuttings were taken. Peat produced the best results from July to November. Sand gave the best results from December on. Roots from peat were less brittle and subject to less breakage than those from sand, according to Chadwick (4).

Sheat (28) and Wells (34) report good success rooting cuttings of yew in shaded frames in summer. The advantage of this practice lies in the low cost of frames and labor at that time. Better percentages of rooting were reported for cuttings rooted in the greenhouse in the winter. Esper (10) found late fall and early winter the best time to take cuttings. Swartley and Chadwick (30) found that January cuttings responded better than November cuttings based on the length of time the cuttings were in the bench. Klein (19) found that cuttings taken in November and December were superior to those taken in January and February.

Kirkpatrick (18) reported that cuttings with a heel rooted better than those without, and Wells (34) prefers such cuttings or at least some second season wood at the base. Longley (22) reported that Canada Yew rooted equally well with one, two, or three year wood at the base, but the latter had longer and more numerous roots, and the larger cutting gave a larger plant. Durham (9) and Chadwick (4) reported no advantage for any particular location of cut. Kirkpatrick reports rooting of cuttings of *Taxus cuspidata* twelve to eighteen inches long.

In the greenhouse bench, Wells (34) recommends a bottom heat of about 70° F. Chadwick and Swartley (6) report that a bottom heat of 70°—75° F. gave better results than 80°—85° F. While Esper (10) found a bottom heat of 65°—70° F., with an air temperature of 50°—55° F., to give best results

Prior to the discovery of growth substances a great many compounds, both organic and inorganic, were tested for their ability to increase the percentage of taxus cuttings rooted or to hasten the process. Most of these were of little benefit, though Chadwick (4) found some benefit from potassium permanganate, 1 ounce to 5 gallons water, soaked for twenty-four hours; and from sugar, 1 pound in 7 gallons of water. Klein (19) rated potassium permanganate, 5% glucose, and 10% glycerine in that order for soaking cuttings before sticking into the rooting medium.

Early trials with growth substances gave varied results. Chadwick and Kiplinger (5) reported that indolebutyric acid at 50, 100, and 150 p.p.m. did not significantly increase the percentage of taxus cuttings rooted, nor the number of roots induced in a three months period. Meahl (24) found that treated cuttings had a greater percentage rooted at the end of nine weeks, but this difference had disappeared at the end of 16 weeks and "The small difference in final rooting was not considered significant." Grace and Farrar (11) found napthylbutyric acid ineffective on percent rooted in 90 days, but the number and length of roots per cutting rooted were increased for all treatments. Poesch (26) found that *Taxus baccata repandens* and *Taxus cuspidata "capitata"* did not respond to treatment, while four other clons gave 10 to 50% increase in percent of cuttings rooted in ninety days. Hitchcock and Zimmerman (13), (15) reported earlier rooting, and discovered that *Taxus cuspidata* cuttings required higher concentrations of indolebutyric acid when taken in October and November as compared with other times of the year. They further reported (14) that deferring the treatment from six weeks to five months after sticking the cuttings, gave better results than treatment at time of sticking. Removing the callus knobs before deferred treatment was beneficial but not practical. Chadwick and

Swartley (6) found re-treatment beneficial but not consistent, and concluded that the benefit was not worth the time and labor involved. They also reported that watering the cutting bench with vitamin B1 did not stimulate root initiation but it did stimulate root growth after the roots are initiated.

Using a-napthyl acetic acid at 50 p.p.m. in water for 48-hour-soak, Tincker and Unwin (33) report 33% more *T. baccata* cuttings rooted in 7 weeks. Fifty percent were rooted in three months, while the controls required six months to root 50% of the cuttings. Oliver (25) rooted 60% of *T. cuspidata* cuttings in 46 days when treated with 80 p.p.m. indolebutyric acid in water for 24 hours. Untreated controls required six months to equal this figure.

Maxon (23), Yerkes (37), Kirkpatrick (18) and others (1), (16), (20), (27), report beneficial results with growth substances. More recently Wells (34) reports their use, as proprietary talc dusts, to be standard practice, mentioning incidentally that "*T. repandens* and *T. fastigiata* do not root well (with commercial dusts) but respond to 2% indolebutyric acid."

Other materials have been added to the growth substances: to control pH, Chadwick and Swartley (6); fungicides, Grace and Farrar (11), and Snyder (29). In general, they have not been effective, and the fermate used by Snyder had an inhibiting effect which lasted about 120 days.

Unlike most plants, taxus cuttings continue the habit of growth determined by the position they had on the parent plant. Cuttings from orthotropic branches or "leaders" produce excurrent trees or "capitata" Japanese Yews. Plagiotropic growth results in one-sided plants unless they are repeatedly sheared to produce spreading shrubs. Thus Wells (34) stresses the value of "straight leader cuttings", and Baltet (3) recommends "the young shoots which spring from the amputated head of the parent tree in the uppermost whorl of branches" as the best cions.

Baltet (3) reports that Yews are grafted by veneering (in February and September, under glass) on seedlings or cuttings. Wells (34) reports that grafting is "used for yellow and variegated forms which do not root readily." The "usual manner" is the method used, by which he probably means side or veneer grafts on potted stock in the greenhouse, as juniper and spruce are handled. Bailey (2) recommends August or early fall for veneer grafting the named varieties on the upright kinds. Sheat (28) concludes "grafting may be carried out but there is little justification for it."

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MODERATOR KEEN: I don't believe that we will take time for questions on the literature at the present time because, while there may be questions, it may be far better to hold your questions until we have heard from some of these men who are well versed and experienced in handling the propagation of taxus.

The first of our speakers this morning has had considerable experience propagating *Taxus* by seeds. He is from Amherst, Ohio. Mr. Laddie Mitiska will discuss "The Propagation of *Taxus* by Seed."

MR. LADDIE MITISKA (Amherst, Ohio): Mr. Chairman, members and guests of the Propagators Society: From the material Mr. Keen has given us we can readily see that the work that has been done in the past good many years has given varied results. We know a good many of the practices used then are outdated. Among the various propagators that are handling yews, everyone seems to have his own method.

In presenting this paper, in which I have gathered the facts as they have happened to us, I know there will probably be a difference of opinion and it is fortunate that I am being followed on this program by two highly successful nurserymen.

Mr. Mitiska presented his paper on "The Propagation of *Taxus* by Seeds." (Applause)

THE PROPAGATION OF TAXUS BY SEEDS

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Taxus are propagated by seed for two reasons. First is to produce the *Taxus "capitata"* of the trade. The other is to produce seedlings of the clones in a search for new varieties, which, to be reproduced, are propagated by cuttings or, very rarely, by grafting.

Although some nurserymen propagate *Taxus "capitata"* by tip cuttings of upright-growing branches of particularly good strain most plants of this type are grown from seed.

Much of the success or failure of growing taxus frm seed depends upon the source and viability of the seed. If one is dependent upon a seed house or collector for the procurement of seed, it is important to know that the seed is from the current crop, and that it has not been exposed to undue heat or drying out. And too, one should make sure that the strain of seed has desirable characteristics. It takes several years before the true form of the plant is ascertained, hence it is important to start with good seed.

We have preferred collecting our own seed whenever possible and have found we could grow a very nice strain of Upright Yew by gathering seed from an especially large and nice specimen of *Taxus cuspidata*. Seeds of a true *Taxus cuspidata* tend to reproduce quite uniformly. Seeds gathered from some of the clones will produce an endless variation of seedlings. Although some may prove to have superior merit, the general picture is one of confusion in the genus *Taxus*. There is always room for superior selections in any group of plants, but instead of adding to the number appearing in the trade, some of the inferior ones should be dropped. Continuing studies by colleges and