CONE AND SEED INSECT NEWSLETTER[1/]

March 1976

1. General

(Johnson - Indonesia)

I haven't had much time to do much professional entomology here in Borneo, but there certainly are a lot of interesting insects for the "oh my" collector. On my desk is a 4-inch-long cicadid, two very large rhinoceros beetles, and a colorful cerambycid. I keep promising myself that I'll put together a collection before I leave here. I have looked at a few samples of dipterocarp seed and have found as many as 90 percent infested with weevil larvae. Mr. Daljeet-Singh, forest entomologist at the Forest Research Institute, Kepong, Selangor, Peninsular Malaysia, has worked with seed pests of dipterocarps and says that weevils of the general *Alcidodes* and *Nanophyes* are the major pests with a few micro-lepidoptera and scolytid beetles of the genus *Poecilips* being of lesser importance.

One really appreciates the problems of tropical foresters in securing good seed. Most of the tropical species in this area have very short lived seed. For example, few dipterocarp seed will store for more than a couple of weeks. The same is true of the conifers *Agathis* and *Araucaria*. Without seasons, there is apparently no evolutionary advantage to seed dormancy. Best wishes.

(Yearian - Arkansas)

Gerald Wallis transferred from research on cone and seed insects to research on the southern pine beetle. Harold N. Greenbaum, having nearly completed doctoral requirements at the University of Florida, was hired to continue research on cone and seed insects in Arkansas pine seed orchards. His special interest is sawflies and is interested in receiving xyelid sawflies, particularly those that feed on pine male strobili.

(Stevens - Colorado)

Our work on the seed and cone insect complex in Engelmann spruce is being conducted on the Fraser Experimental Forest in

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[1/] Contributions submitted by cone and seed insect research workers, resource managers, and tree improvement specialists. These unpublished data cannot be used without contributor's approval. Items assembled by G. L. DeBarr, U. S. Forest Service, Athens, Ga.

central Colorado and is in its second year. We now have a few items to report. *Laspeyresia youngana* (Kft.) is undoubtedly the primary cause of seed destruction in Engelmann spruce on our study area. Seventy-five percent of the cones collected in 1975 were infested, and 39.1% of all seeds were destroyed. We have reared numerous other insects, some yet unidentified, and we will have more information on these by next printing. We've also used light traps to collect emergence information on some of these insects. This information, too, will be available at a later date.

(Cameron - Texas)

Garland Mason recently finished his doctorate degree and accepted a position at Stephen F. Austin University. Scott Cameron has taken over Garland's responsibilities related to cone and seed insects at the Texas Forest Service.

(Mason - Texas)

I am teaching and conducting research in forest photogrammetry at the School of Forestry, Stephen F. Austin State University at Nacogdoches, Texas. While my new employment demands a certain diversification of my activities, my interest lies in the application of remote sensing techniques to forest management--I hope even to tree improvement. I still maintain a deep interest in seed protection and plan to cultivate the interest in the future.

(Lantz - Georgia)

I have joined the Forest Service-State & Private Forestry at the Decatur field office as Nursery-Tree Improvement Specialist for the Southeastern Area. I'll be getting in touch soon to get caught up on new developments in nursery and seed orchard insect control.

(Barber - North Carolina)

Thomas H. Flavell, Supervisory Entomologist, S&PF, Forest Resource Protection, Asheville, N. C., transferred to S&PF, Forest Environmental Protection, Missoula, Montana, in July 1975. Larry R. Barber was hired as an entomologist with S&PF, Forest Resource Protection, Asheville, N. C., July 20, 1975.

Projects for next year include (1) a Region-wide impact study, (2) an applicator test to apply Furadan 10G to the soil, and (3) a Furadan test on white pine.

(Hertel - Louisiana)

The Southeastern Area, State and Private Forestry, Resource Protection Unit, has realigned to form four separate groups, two of which will be involved in seed orchard work, i.e., the Forest Insect and Disease Management Group and the Methods Application Group.

The Forest Insect and Disease Management Group will be charged with seed orchard evaluations and recommendations, while the Methods Application Group will be involved with the leadership, planning, and direction of methods application and development testing activities.

Frank M. Yasinski is the Group Leader of the FI&DM and MAG Group in Atlanta. The Asheville Field Office has John H. Thompson (FI&DM) and Robert D. Wolfe (MAG) as Field Representatives. Robert Loomis (FI&DM) and Gerard Hertel (MAG) are the Field Representatives in the Alexandria Field Office. Lawrence Barber (MAG) will be working on seed orchard problems in the Asheville Field Office and Neil A. Overgaard (MAG) in the Alexandria Field Office.

(Schenk - Idaho)

The research program at the College of Forestry, Wildlife, and Range Sciences, University of Idaho, on cone and seed insects has received relatively little emphasis the past 1 to 2 years. However, a "stand-by" project (detection, distribution, etc.) is sustained by our experiment station and may be intensified if regional support should develop. Current effort is directed toward publications arising from (1) the recently completed thesis by D. L. Kulhavy on the insects affecting cones and seeds of grand and sub-alpine firs in Idaho, and (2) the dissertation of J. W. Dale on the bionomics of the cone and seed insects of ponderosa pine.

Russ Clausen is now a Research Associate with the Department of Entomology, University of Idaho, and is working on the Douglas-fir tussock moth project. His field work on the bioenergetic relationships of the cone and seed insects of Douglas-fir is completed, but data analyses and dissertation are still in the future.

Dave Kulhavy is near completion of his doctorate work under Ron Stark at the University of Idaho on the relationship between bark beetles and root pathogens on western white pine.

John Dale is a forest entomologist engaged in research with the Nigerian government at their Federal Department of Forest Research, Entomology Section (Ibadon).

(Yates - Georgia)

Dr. Gerhard F. Fedde, forest entomologist formerly at the Research Triangle Park Laboratory in North Carolina, joined the seed orchard insect project at Athens on March 15. He will initially work on identifying the agent or agents causing severe branch dieback and tree mortality in several southern seed orchards.

Mrs. Vicki H. Fedde is presently completing her residency requirements for a doctorate at the North Carolina State University. She also has been assigned to the Athens project and will report in August.

2. Insect Identification and Biology

(Hedlin - B. C., Canada)

Work in progress: Field trials were conducted using 15 different synthetic compounds to obtain some preliminary information on attractants for male moths of *Barbara colfaxiana*. Compounds were used with Pherocon-2 insect traps. One of the compounds, cis-9-dodecen-1-ol, was strongly attractive. In similar trials with *Laspeyresia youngana*, trans-7-dodecen-1-ol proved to be strongly attractive to male moths. Pheromone extraction and bioassay studies are being conducted on both species. Dr. I. Weatherston, a chemist from Sault Ste. Marie, Insect Pathology Research Institute, will spend January and February at the Pacific Forest Research Centre carrying out the extraction work. If results of bioassays show promise, further field trials will be conducted in 1976.

Tentative identifications indicate that 3 different species mine the cambium adjacent to graft unions in Douglas-fir. On the basis of these identifications, *D. contortella*, *D. abietivorella*, and *D. pseudotsugella* are involved. Munroe and Mutuura are not in complete agreement on the identifications, but I expect this to be clarified in the near future.

(Goyer - Louisiana)

Analyses of the precise attack periods of insects affecting loblolly pine and seed cones revealed that two species of *Dioryctria* coneworms, *D. disclusa* and *D. clarioralis*, have but one generation per year in Louisiana. A third species, *D. amatella*, was the most prevalent in the one seed orchard studied and was found to have 4 or 5 generations per year. Thrips were found feeding directly on loblolly conelets and cones from March to May. *Pityophthorus* sp. was found to have one generation per year, initiating attack in

March and early April. The seedbug *Tetyra bipunctata* oviposits in late July and August, and nymphal development was completed before cone harvest in early October. Overwintering adults have been observed in November, March and May.

(Yearian and Greenbaum - Arkansas)

Initial biological studies on *Dioryctria "amatella"* (Hulst) indicated 3 apparent chromomorphs with considerable overlap. Five groups were recognized: A) typical *"amatella"* which have the forewings black to smoky with distinctly white crossbands having few grey scales, and few if any amber scales; B) intermediate *"amatella"* which are similar to A but have the crossbands with considerable numbers of grey scales; C) *"taedae"*-like which have the forewings mostly smoky with the crossbands distinctly grey and with several interdispersed amber scales in the basal 0.67 of the wings; D) intermediate "n. sp. (*zimmermani* complex)" which are similar to C but have considerable numbers of amber scales in the basal 0.67 of the forewings giving the forewings a noticeably ferrugineous background color; and E) "n. sp. (*zimmermani* complex)" which has the background color distinctly ferrugineous from a profusion of amber scales, and distinctly grey crossbands. Groups A and E are *Dioryctria "amatella"* (Hulst) and "n. sp. (*zimmermani* complex)" as defined in Ebel *et al.* (1975); group C resembles *D. taedae* Schaber and Wood, but is not positively determined as that. These chromomorphs suggest a chromo-complex genetically or environmentally determined which may also have a biological effect. Further studies are planned to compare biological and ecological data of the different chromomorphs, and to attempt to isolate genetic factors by controlled matings.

Several parasitoids were reared from various cone and seed insects.

3. Damage

(Cameron - Texas)

As part of the cooperative effort directed by Carl Fatzinger to quantify the impact of insects on southern pine seed yields, the Texas Forest Service established a study in a loblolly seed orchard which will continue through the 1976 cone harvest. A caging study is being conducted parallel to the impact study to help quantify losses caused by seedbugs.

(Copony and Tigner - Virginia)

A two-year caging study to evaluate cone and seed insect damage in our loblolly seed orchard was completed this fall. Data are still being analyzed. There is some indication that empty seed in caged cones may result in part from the caging itself, even when cones are enclosed after pollination.

(Hertel - Louisiana)

An undetermined species of needle midge, *Contarinia* sp., caused dieback to loblolly pines at the Erambert and McNair Seed Orchards in Mississippi (1971-1975). Seventeen percent of the loblolly pines suffered medium to heavy dieback due to defoliation by the midge at the Erambert Orchard during 1974, and certain clones of loblolly at the McNair Orchard experienced severe defoliation and dieback due to midge infestation during 1975.

The midge feeds beneath needle fascicles causing brown lesions and needle bending, which are manifest when needles grow out. Heavy feeding results in needle drop. Cygon® and Guthion® sprays are suspected as factors that contribute to midge epidemics. A feeding preference for certain clones was shown by the midge at both the Erambert and McNair Orchards.

(Barber - North Carolina)

For the past 2 years, one seed orchard has experienced high conelet abortion in July and August. About 200 *Moodna ostrinella* Clemens were reared from the dead aborted conelets. The conelets showed no exterior insect damage, but appeared to be off color and when touched would readily fall off the tree. This insect, while reported to be a secondary pest, was found quite often in dead conelets.

(Hertel - Louisiana)

A total of 92.7 percent of the total potential cone crop was lost to all causes during the 1974-75 growing season at the Ouachita Orchard, Mt. Ida, Arkansas. The following were agents causing losses: tip moths, 45.2%; coneworms, 5%; unknown insects, 7.9%; abortion, 20.5%; missing, 11.1%; and other, 3.0%.

At the Stuart Orchard, Louisiana, during 1975, 75% of the first year flowers were lost due to all causes on shortleaf pines, 47% on loblolly pines, 65% on slash pines, and 80% on longleaf pines. Coneworms were the greatest single identifiable agent causing

flower loss (1.3% on shortleaf, 11.6% on loblolly, 27% on slash, and 14.7% on longleaf).

Both of these evaluations were part of a southwide cooperative test by the Seed Orchard Sampling Committee.

An impact study on loblolly pine trees 30 feet tall at the Stuart Orchard, Louisiana, showed significantly fewer tip damage by tip moth on a heavy fertilized area[1] (9.3%) than on the check area[2] (31.8%) at the 5% level of confidence. Coneworm damage to first year flowers was 3.1% on heavily fertilized areas and 11.6% on check areas.

4. Control

(Hertel - Louisiana)

A field test was conducted during 1974 using 28, 56, 112, and 224 g of Furadan® (10% granules) per inch d.b.h. for tip moth control on shortleaf pines (4 feet to 20 feet tall) at the Stuart Orchard, Louisiana. The above rates were applied with one application (in Febraury) and with two applications (once in February and once in June) for a total of nine treatments, including the check.

The rates of 56, 112, and 224 g/2.5 cm d.b.h. afforded good shoot protection from tip moth attack with one application (10%, 9%, and 3.5% damaged tips, respectively, as compared to 51% for check trees). All treatments were significantly better than the check. The 56 g rate applied once was as good as all higher rates.

A field test using Furadan® (10% granular) disked in during February at the rates of 112, 224, and 336 grams per 2.5 cm of tree diameter on shortleaf pine trees (20 to 30 feet tall) was conducted at the Stuart Seed Orchard during 1975. Only the 336 gram treatment gave adequate protection of the top 20 vegetative shoots from tip moth attack. Approximately 70% of the shoots were attacked on check trees and 9% on the 336 g treatment trees.

1/ Treated with 270 kilograms (600 lbs) per acre of 12-12-12 fertilizer on March or April from 1972 through 1975.

2/ Treated with 130 kilograms (285 lbs) of 12-12-12 fertilizer in April 1975 and 230 kilograms (500 lbs) per acre in August 1975.

DiSyston® applied in March 1975 at the rate of 70 g of 15% granules per 2.5 cm d.b.h. and watered in was effective in protecting the 20 topmost shoots of shortleaf pines from tip moth attack at the Ouachita Seed Orchard, Mt. Ida, Arkansas, until August (7% shoot attack vs. 29.5% for check trees); however, protection was reduced by October (37% shoot attack vs. 67% on check trees).

(Neel and Jones - Mississippi)

Our work in 1975 consisted of repeating a carbofuran 10G method of application study begun the previous year. Slash pine trees in the Scott Paper Company Seed Orchard were treated as follows: control--no insecticide; band--8 oz/inch DBH; broadcast (1)--8 oz/inch DBH; broadcast (2)--16 oz/inch DBH; drill--8 oz/inch DBH. The carbofuran treatments were split applications; one-half the total insecticide per tree was applied on April 4, and one-half was applied on June 6. Five clones were used with 1 ramet/clone in each treatment (5 trees).

Second-year cones in the 4 treatment groups attacked by *Dioryctria* in 1975 followed a pattern similar to that in 1974. Cones in the broadcast and drill treatments sustained less than 5% damage. Cones from the banded trees were infested only at a slightly higher rate (16.1% in 1975 vs. 15.1% in 1974). Cones in the control treatment were more heavily infested than in 1974 (30.5% in 1975 vs. 19% in 1974). The band treatments were obviously less effective than the broadcast or drill treatments.

We found that 28% of the conelets tagged early in 1974 had been destroyed by *Dioryctria* spp. by the end of 1975. We had noted that conelet protection in 1974 and all 3 application methods had been exceptionally good. Results of conelet protection from *Dioryctria* spp. in 1975 is not known since no conelets were tagged at the beginning of this year.

The mean seed yield per cone was considerably less in the control treatment than in any of the carbofuran treatments (1974 test). The percent empty seed (5.9%) was noticeably less in the broadcast (16 oz) rate than in any of the other treatments. The number of seed destroyed by seedbugs was about 3 times as great in the control as it was in any of the other treatment groups. (Note: Seed yield data and cone bug damage results were obtained from analyses conducted by DeBarr and his group at the Forestry Sciences Laboratory, Athens, Ga.)

An evaluation of carbofuran granules for coneworm control applied to 17- to 18-year-old slash pine trees (Scott Paper Company) was also made in 1975. *Dioryctria* spp. control on 2nd-year cones from these trees was less effective than from carbofuran applications made to younger trees in this same orchard.

(Cameron - Texas)

As part of a southwide study directed by Gary DeBarr, one soil application of 10% granular carbofuran was applied at 3 rates in the spring of 1975 to both a slash and loblolly pine seed orchard. The cones harvested from treated and control trees are being analyzed for insect damage.

(Goyer and Nachod - Louisiana)

Results of 2 years of pilot trials on 4-acre blocks with carbofuran granular systemic insecticide showed that insect-caused losses were reduced in all treatment rates and application schedules tested. The February 1 application date of 4 oz. formulation (10G) per inch of tree diameter reduced losses from 28% to 7% over the 18-month period of flower development.

(Copony and Tigner - Virginia)

Caging studies showed that Furadan® at a rate of 8 ounces per diameter inch was effective against *Leptoglossus corculus* when applied early in the year. Survival of bugs in July and August averaged 3% on trees treated with Furadan® in February. Survival on untreated trees was 78% during the same period. Radiographs showed that bugs fed upon cones of treated and untreated trees at roughly the same rate (i.e., about one seed per bug-day). Later treatments in June and July had no effect upon survival. Tests will continue in 1976 to corroborate this year's results, to evaluate other times and rates of application, and to determine duration of effectiveness.

(Hedlin - B. C., Canada)

Anthio, Cygon and Samibark were applied as sprays (2% and 4% active ingredient in water) to infested trunks. Results were negative for all insecticides. Trials are currently under way using tanglefoot on graft unions in an attempt to prevent damage.

Use of Vapona strips in bags which were on conelet-bearing twigs was not effective in preventing damage by *Barbara colfaxiana*. Eggs were laid on the conelets prior to bagging.

(Lantz - Georgia)

Before I left Oklahoma State University, we set up a study to evaluate blacklight traps as a population control method for conemoths--primarily *Dioryctria* species. This study will be carried out throughout the 1976 growing season. I am hopeful that some positive results will emerge!

(Yearian - Arkansas)

Carbofuran was tested on 5 clones in the Arkansas Forestry Commission loblolly pine seed orchard near Bluff City. Granular and flowable materials were applied at rates of 0.025, 0.050, and 0.100 lbs actual carbofuran per inch DBH in a single application within the dripline of each tree. Results indicated that carbofuran reduced coneworm damage, with some clonal and intraclonal differences.

(DeBarr and Nord - Georgia) Insecticide Screening

Thirty-two insecticides have been screened against the leaffooted pine seedbug, *Leptoglossus corculus*, 2nd instar nymphs and adults. Topical applications were used to develop dosage-mortality curves and determine the median lethal dose (LD_{50}). The most promising insecticides will be evaluated in a program of additional laboratory and field tests.

(DeBarr - Georgia) Southwide Furadan® Seed Orchard Test

During 1974, tests were conducted in 11 seed orchards across the Southeast utilizing more than 800 trees. In 1975, new tests were initiated in 20 additional seed orchards while observations were continued on trees in the 1974 tests. These tests are very rigorous because only a few trees are treated in large blocks of untreated trees. General conclusions about the effectiveness of Furadan® based upon 1974 and 1975 test results are as follows:

1. Furadan® is superior to Thimet® for controlling coneworms and seedbugs, based upon comparative tests in individual seed orchards.

2. Coneworm control with Furadan® was fair to excellent in 1974, but some tests were installed late. In the 1975 tests, all applications were made in February and coneworm control was excellent.

3. Furadan® provided excellent control of seedbugs; treatments doubled and tripled the yields of filled seed per cone from 1974 test trees, even though the cones were protected only during the second year of strobili growth.

4. Furadan® controlled coneborers, *Eucosma*, on Virginia pine.

5. On white pine, cone beetles killed 92% of the cone crop on the check trees while only 3% of the cones were lost on Furadan® treated trees.

6. Single applications were generally equal to or better than split applications, i.e., it proved better to put all the insecticide on at once rather than dividing the material and applying it on two or three application dates.

7. The 8 oz./inch of DBH dosage rate generally proved better than the 4 oz./inch of DBH, but the increased increment in seed production may not be great enough to justify the doubled cost.

8. Two successive annual applications of Furadan® significantly increased survival of the cone crop. As an example, in one orchard 15% of the crop on the check trees survived, while nearly 90% of the crop on the treated trees survived.

9. There appears to be little or no carryover control of coneworms from a single application of Furadan® from the previous year.

10. No foliar phytotoxicity was observed at the 4 or 8 oz. rates. Some needle burning occurred on the needle tips at the 16 oz. rate. In specific phytotoxicity tests, 32 ozs. of Furadan® 10G per inch of DBH caused moderate needle burning on some clones. In extensive seed germination tests involving thousands of seed, we detected no depression of full seed germination or any increase in the number of abnormal seedlings in samples of seed from trees treated with Furadan®.

Furadan is not the panacea for seed orchard insect problems. Some of the more obvious disadvantages include:

1. The material is expensive, but relative to the only insecticide registered for seed orchard use, Guthion®, the costs are comparable.

2. Soil systemics require the proper rainfall pattern in order to work effectively.

3. Carbamates are very toxic to wildlife. Furadan® is extremely toxic to birds; therefore, it must be incorporated into the soil.

FMC, the manufacturer, is very eager to expand the Furadan® label for seed orchard use. The EPA requires a minimum of two years of field testing. Both our 1974 and 1975 test results show the effectiveness of Furadan® for coneworm and seedbug control. This should be sufficient efficacy data to support a request for registration. Data on phytotoxicity in terms of foliar burning with 4X and 8X rates and effect on seed germination have also been collected.

The manufacturer believes that a minimum of three months will be required once the request for a registration expansion has been submitted. Optimistically then, we can hope for a registration for the 1977 field season.

5. Publications

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