John A Schenk

CONE AND SEED INSECT NEWSLETTER[1]

March 1977

1. General

(Merkel - Florida)

The forest insects research work unit at Olustee has been reorganized into two major problem areas, i.e., (1) insects affecting the production and quality of pine seed in the slash pine ecosystem, and (2) bark beetles affecting naval stores and lightwood production. Dr. Carl W. Fatzinger, Principal Research Entomologist, has been designated team leader for problem (1), and I'm back on the bark beetles after a 20-year break--I've almost forgotten what the little critters look like! Working under Carl are Isadore L. Williams, Jr., Entomologist, and three technicians. I do, however, have a few cooperative studies on cone and seed insects to complete and as Project Leader will probably continue to bootleg some cone and seed insect research.

(Gibson - Ohio)

I am not currently actively engaged in seed-insect research, so I have little to contribute to the newsletter.

I do have a manuscript that is at the FS editor. It is titled "Monograph of the genus *Curculio* in the New World (Coleoptera: Curculionidae). Part II. Mexico and Central America." It will be about 26 pp. published. It covers all known species (27) from that area. Of these, 18 are described as new species. The distribution, hosts, and biologies are included when known.

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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 These unpublished data cannot be used without contributor's approval.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, Georgia.

(Goldman - Georgia)

International Paper Company, Southlands Experiment Forest, has added to their staff an entomologist, Suzanne E. Goldman. Studies planned for the 1977-1978 season include comparing the effectiveness of Guthion® and Furadan® on seed orchard insect control. Furadan® will be tested operationally at various rates and times of the year to determine the optimum treatment rate and time.

(Schenk - Idaho)

Personnel: John A. Schenk
Shane D. Weber
David L. Kulhavy
Russell W. Clausen

New Projects: A project entitled "The effect of shelterwood cuttings on grand fir cone and seed production, and losses due to insects in northern Idaho" was initiated in late summer of 1976. The objectives of this project are to (1) ascertain the response in cone and seed production of grand fir to two levels (heavy/light) of shelterwood cuttings, and (2) compare insect-caused seed losses under the two logging treatments and under undisturbed conditions. Verification and validation of a prediction equation (Kulhavy and Schenk 1976) for estimating grand fir cone crops from ground observations also will be done. This research will be conducted by Shane Weber, Graduate Assistant (M.S. degree) working with Schenk.

Continuing Projects: Russ Clausen, now a Research Associate on two Douglas-fir tussock moth projects, is continuing (at a much reduced pace) his work on the bioenergetic relations of the cone and seed insects of Douglas-fir.

(Hertel - Louisiana)

I am now the staff entomologist coordinating Forest Insect and Disease Management's (USDA, Forest Service, Southeastern Area, State and Private Forestry) seed orchard insect program. Larry Barber (Asheville Field Office) and Neil Overgaard (Pineville Field Office) will handle the seed orchard insect work in their respective zones.

(Mattson - Minnesota)

While in France last September, I met a young French entomologist, Dr. Alain Roques, who did his doctoral research on insects affecting cone production in *Pinus sylvestris*. His dissertation is titled "Etude de la merocenose des cônes de Pin sylvestre en forêt de Fontainbleu" and is roughly 175 pages in length. It looks like an excellent piece of ecological research that should be of general interest to ecologists, especially those of us working with seed and cone insects. He investigated such things as: (a) cone distributions; (b) insect impacts, including cone life tables; (c) parasites of cone, shoot, and gall insects; (d) insect life histories; and (e) rearing media for cone insects.

Copies of this disseration may be obtained from Dr. Roques, whose address is: INRA - Centre de Recherches Forestiérs, Laboratoire de Zoologie et Biocenotique Forestiérs, ARDON - 45160 - Olivet, FRANCE.

In the next month, a Station Research Paper (NC-136) should be out on "The distribution of the cone insect, *Dioryctria disclusa*, in red pine."

(Stevens - Colorado)

Our work on the seed and cone insect complex in Engelmann spruce has been completed and is being written up for publication. Work has been started on the insect complex found in lodgepole pine and subalpine fir cones. All work is being conducted on the Fraser Experimental Forest in central Colorado.

2. Insect Identification and Biology

(Williams and Merkel - Florida)

We've finally encountered a potentially serious cone midge problem on slash pine in a seed orchard in Nassau County. Second-instar larvae have thus far been identified by Dr. R. Gagné (USNM) as *Cecidomyia*, possibly *resinicola* (O.S.). We hope to obtain adults in January-February 1977 for identification. Eggs are apparently laid on or near the female strobili soon after pollination and larvae feeding in the scale tissue (not the seeds) produce grotesque, swollen scales. At this date, it does not appear that infested cones will open to produce seed even if cones mature.

(Hedlin - British Columbia)

Pheromone studies -- laboratory and field studies on *Barbara colfaxiana* and *Laspeyresia youngana* were continued. In field tests it was shown that male *Barbara* moths are strongly attracted to 98/2 trans/cis isomer ratios of 9-dodecen-1-01. Male *L. youngana* moths are attracted to a similar trans/cis isomer ratio of 7-dodecen-1-01. A range of synthetic chemicals tested against *L. piperana* did not give positive results.

Douglas-fir flowers were collected in the spring of 1976 and were freeze dried to obtain volatile materials. Dr. I. Weatherston, Sault Ste. Marie, will separate materials for lab. and possibly field testing as possible sources of attraction to female *B. colfaxiana*.

Cone collections were made from 165 Douglas-fir clones in seed orchards. Cones were examined for insect attack and seed loss, and data are being analyzed.

(Goyer - Louisiana)

The seasonal attack periods and role of insects destructive to loblolly pine (*Pinus taeda* L.) cones and seeds in Louisiana seed orchards were studied from August 1974 to October 1976.

Fine mesh nylon screen cages were used to exclude insects and determine the seasonal attack periods for (1) cone-feeding insects: coneworms, *Dioryctria disclusa* (Heinrich), *D. clarioralis* (Walker) and *D. amatella* (Hulst); cone midges, *Resseliella* and *Asynapta* sp.; and (2) seed-feeding insects: *Leptoglossus corculus* (Say) and *Tetyra bipunctata* (H. & S.) from August 1974 to September 1976 at the DeRidder Seed Orchard.

D. amatella was found to have four peak attack periods annually: one in spring, two in summer, one in fall. Moth flight activity monitored by blacklight traps, and seasonal development of larvae as found in supplemental cone collections from August 1975 to September 1976, were in accordance with the seasonal attack periods of *D. amatella* ascertained in the exclusion study.

Cone midges were found damaging several second-year cones but were found more commonly in association with cones damaged by *D. amatella*. Conelet abortions were not concurrent with peak attack periods of cone midges, coneworms or seedbugs.

Seedbug surveys conducted at orchards in Jonesboro, Bogalusa and DeRidder revealed that populations varied with each locale and from year to year. Intensive sampling of second-year cone-bearing branches at the DeRidder orchard in 1976 showed that the incidence of seedbugs was highest in July and August. A comparison of field survey data to radiographic analysis of seed losses showed that most second-year ovule abortions occurred during the period of rapid cone growth and with peak abundance of *L. corculus*. *T. bipunctata* was found to be univoltine.

(Hertel and Overgaard - Louisiana)

A midge, *Contarinia* sp., causing needle droop and defoliation to loblolly pines was first discovered at the Erambert Federal Seed Orchard in Brooklyn, Mississippi, in 1971. Since severe dieback and defoliation associated with midge occurred in 1974, a 100 percent ground survey was conducted to determine the extent of the damage and the possible existence of certain clonal preferences. The survey showed 30 percent of the trees in the medium to heavy damage class in the south Mississippi loblolly geographical seed source, 17 percent in the Alabama loblolly seed source, and 5 percent in the north Mississippi loblolly seed source. A statistical analysis showed a definite feeding preference by the midge for certain clones. A study to determine larval feeding periods showed that the midge feeds May through August, with major feeding peaks in June and July.

Midge populations increased from 1971 when Cygon® (dimethoate) was first applied until 1974 when severe defoliation occurred. Midge populations collapsed and the trees showed a complete recovery from the previous year's defoliation with the discontinued use of Cygon® during the 1975 season. Therefore, this insecticide is suspected as playing a role in causing midge outbreaks.

(Copony - Virginia)

We have just about completed our evaluation of seed losses of the 1975-76 cone crop in our loblolly seed orchard. The study included all losses from flower closure to cone harvest. We compared cone and seed yields from protected and unprotected trees.

Losses amounted to 73.3% of the total seed potential with insect-caused losses amounting to 37.2%. Seedbug damage during the first year of cone development was the largest single loss factor (26.4%).

(Tigner - Virginia)

Other data indicate that Furadan® might have residual effectiveness against *Dioryctria* (but not *Leptoglossus*) the year following application. This possibility will be re-examined in 1977.

3. Damage

(Cameron - Texas)

An impact study was conducted in a high wood density loblolly seed orchard near Magnolia Springs, Texas, as part of a southwide cooperative test. Preliminary results revealed 31.4% of the 1974-75 conelets and cones were lost to all causes; 12.5% of the losses were directly attributed to insects. The surviving cones contained an average of 98.2 seeds, 64.1% of which were full. Cones from the same trees protected in cages throughout the second year of development yielded an average of 98.0 seeds per cone, 71.0% of which were full. Additional data is currently being collected for the 1975-1976 cone crop.

(Copony and Tigner - Virginia)

We are continuing to refine our use of Furadan® for control of cone and seed insects in the Division's loblolly pine seed orchard. By the end of 1977, data from cone analyses and field bioassays should provide a reasonable basis for calculating economic thresholds under various conditions of crop size, application rate, and length of protection. In addition, we hope to determine if treatment can be put off until after the greatest danger of frost. Results to date show that application can be delayed at least until mid-April.

4. Control

(Fatzinger - Florida)

Orthene® is presently being tested for control of cone and seed insects on slash pine in the McColskey Still Seed Orchard near Lake City, Florida. The treated trees were sprayed during the second week of January 1976 and again during the last weeks of February and June with Orthene® spray solution containing

1 kg. AI/210 l. of water. Preliminary results indicated that the insecticide was effective in controlling cone-destroying insects. The effect on thrips attacks was not directly measured during the first 3 months of the study, but the untreated trees had only 66 percent as many conelets in April as did the treated trees. At cone harvest in October 1976, i.e., six months after the initial conelet counts were made in April 1976, the treated trees had retained 92 percent of their second-year cones and 91 percent of their first-year conelets, whereas the untreated trees had retained only 86 percent of their second-year cones and 79 percent of their first-year conelets. Insects were responsible for most of the losses incurred on the untreated trees.

(Cameron - Texas)

A 10-acre block of 12- to 14-year-old high wood density slash pine seed orchard trees was treated 5 times at monthly intervals with Guthion® in 1975 and an adjacent 10-acre block was left untreated. These blocks yielded 497 and 501 lbs of cleaned seed, respectively, in 1975. Both areas were treated 5 times in 1976. The block treated 2 consecutive years yielded 667 lbs of cleaned seed in 1976 and the block treated during 1976 only yielded 272 lbs of seed. This strongly suggests that the greatest amount of seedbug and coneworm damage occurred during the first year of cone development.

(Neel and Lambert - Mississippi)

A comparison of two methods of application of carbofuran granules was made in a Mississippi slash pine seed orchard. Applications of 8 oz/in DBH by a Gandy fertilizer spreader (GANDY), followed by light disking, was compared to the same rate of application by a zip seeder, ZF-6 (ZIP). Periodic observations of the tagged cones and conelets (10%) showed that the percentage of 2nd-year cones killed by *Dioryctria* spp. was: GANDY, 2; ZIP, 1.8 and CONTROL, 6.6; the percentage of 2nd-year cones damaged was: GANDY, 42.9; ZIP, 51.8 and CONTROL, 76.9. The percentage of 1st-year cones killed by *Dioryctria* spp. was GANDY, 0.8; ZIP, 2.8 and CONTROL, 1.8; the percentage of 1st-year cones damaged by this insect was GANDY, 59; ZIP, 50.2 and CONTROL, 47.8.

An analysis of sound and damaged seed from 2nd-year cones to determine the effect of carbofuran granule applications on seedbug control has not been completed.

In summary, this study showed no difference in degree of *Dioryctria* control between Gandy spreader and Zip seeder methods of carbofuran applications. A noticeable reduction of damage to 2nd-year cones was apparent. The carbofuran applications had little or no beneficial effect in protecting 1st-year cones from *Dioryctria* damage.

(Mehary and Cade - Washington)

Pilot studies to test selected chemicals for the control of the Douglas-fir coneworm, *Dioryctria abietivorella* Grote, were tested during 1976 at a Weyerhaeuser seed orchard in northwest Oregon. Two separate studies were initiated and aligned to flower availability.

Study I. Treatments consisting of Furadan® granules, Furadan® spray and control were each applied to a single ramet of 8 clones.

Study II. Treatments consisting of Orthene, dimethoate Guthion, Lindane and control each applied to 2 ramets of 4 clones.

Furadan® granules of 10 percent active ingredient at the rate of 6 ounces per inch of tree diameter were applied in early April. The other 5 insecticides were applied in spray form at concentrations of 0.5 percent active ingredient by a mist blower from a lift truck until foliage wetness. The spray applications were made in the middle of May, June and July.

Data analysis on cones collected in September is in progress; however, available data indicates that seed and cone insect infestations were low for 1976. A brief summary of the data is given in Table 1.

The Furadan® granules are comparatively ineffective because the April application was too late for proper translocation of the systemic insecticide in time to achieve control.

Though *Dioryctria* infestation was low in 1976, this insect is known to occur sporadically and is capable of causing considerable damage.

TABLE 1. 1976 Summary of Dioryctria Cone Damage

Treatment	No. of Clones	No. of Ramets[1]	No. Observed Cones	% Dioryctria Damage
Study I				
Furadan (Spray)	7	7	641	0.31
Furadan (Granules)	8	8	1,307	3.21
Control	7	8	547	5.67
Study II				
Dimethoate (Cygon)	4	8	1,129	0.18
Guthion	4	7	721	0.0
Lindane	4	7	710	0.56
Orthene	4	5	253	0.0
Control	3	3	124	8.07
Total	12	53	5,432	

[1]Some ramets were excluded because of inherent incompatibility and due to cone population less than the minimum 30.

(Flavell - Montana)

Shortly after arriving in Missoula, I had a request from the Clearwater National Forest for a method to control the mountain pine cone beetle, *Conophthorus monticolae* Hopk., in western white pine seed production areas. Scott Tunnock and I designed a small field test of carbofuran which was "put in" by Scott and Gerald Franc, forester on the Clearwater. Gerry assumed major responsibility for all the field-work since Scott and I were tied up with a budworm pilot project.

The test was done in a relatively young stand of white pine (30 to 70 feet tall) which was moderately to heavily infested by the cone beetle. Carbofuran was placed in holes distributed evenly within the area from trunk to drip line around each tree. After consultation with Gerry, we tried three dosage rates--12, 16, and 24 ounces-- of the 10-gram formulation per inch of diameter. Five trees were treated with each rate.

Unfortunately, the results showed there was no treatment effect. Cones are now being analyzed for carbofuran residue by the Insecticide Evaluation Project in Berkeley, California. Since carbofuran is the only insecticide to have shown promise for *Conophthorus* sp., we are also sponsoring some screening tests to determine if it is effective on the western species.

(Merkel - Florida)

With the help of the University of Florida Forest Tree Improvement Cooperative, we are attempting to obtain EPA approval of a State of Florida label for the use of malathion to control the slash pine flower thrips, *Gnophothrips fuscus* (Morgan). This will be an interesting test case since experimental data on efficacy is very limited. Researchers in other states may wish to try a similar approach.

(Hertel and Overgaard - Louisiana)

Several field tests and operational projects for tip moth control were conducted using Furadan® (carbofuran), Cygon® (dimethoate), and Di-Syston® (disulfoton) on shortleaf and/or loblolly pines during 1974 and 1975. Furadan® was tested on shortleaf pines at the Stuart Seed Orchard, Louisiana in 1974 and 1975. In 1975, operational projects using Cygon® on loblolly pines at the Stuart Orchard and Cygon® and Di-Syston® on shortleaf pines at the Ouachita Seed Orchard, Arkansas were monitored. In addition to the above, an evaluation was conducted of the incidence of tip moth damage on heavily fertilized loblolly pines at the Stuart Orchard in 1975.

The field test at Stuart Orchard during 1974 using Furadan® (10 percent granular) on shortleaf pines (4.27 m = 14' tall) once (February) and twice (February and June) showed that rates of 56, 112, and 224 g/2.5 cm (2, 4, and 8 oz/in) d.b.h., applied once gave good protection to tips through September. There were no significant differences among the three rates. Neither 28 g (1 oz) rate was effective (effective = reduction of tip damage <10 percent). Double applications were not superior to single applications. No residual tip protection was shown by a June 1975 evaluation of test plots, except for the 224 g (applied twice) treatment.

The field test during 1975 at the Stuart Orchard using Furadan® (10 percent granular) at the rates of 112, 224, and 336 g/2.5 cm (4, 8, and 12 oz/in) d.b.h. on shortleaf pines 8.5 m (26 ft) in height showed that only the 336 g treatment gave adequate tip protection from tip moth attack. None of the treatments were effective in protecting conelets from tip moth damage.

Cygon® (3.5 ml/l = 4 pts/100 gal of water) applied operationally in three applications as a drench spray was ineffective in protecting conelets or tips on loblolly pines at the Stuart Orchard and was only partially effective in protecting shortleaf pine tips at the Ouachita Orchard. The reason for the failures was considered to be the fact that some spray applications were missed.

Di-Syston® (15 percent granular) applied in March 1975 at the rate of 70 g/2.5 cm (2.5 oz/in) d.b.h. was four times more effective than the control in protecting shortleaf pine tips from tip moth attack at the Ouachita Orchard according to an August evaluation; however, protection was reduced to two times the control by October. It, as well as Cygon®, gave some evidence of protecting conelets from tip moth attack. However, significantly more conelets were lost due to other factors on Cygon® treated trees.

The heavy fertilization treatment (109.3 kg/ha = 600#/acre) showed significantly fewer damaged tips (9.3 percent) than the control (31.8 percent).

(Hertel and Barber - Louisiana)

Forest Insect and Disease Management, Southeastern Area, State and Private Forestry is conducting a pilot test during 1977-1978 using a John Deere Pow'r Till Seeder® for applying Furadan® 10G for seed and cone insect control. The main objective of the study is to determine if the seeder adequately incorporates Furadan® granules so as to minimize bird mortality. The second objective is to determine if Furadan® applied by this method at the registered dosage rate is effective for controlling seed and cone insects in southern pine seed orchards.

The test will be applied to a 30-acre block each in two loblolly pine seed orchards in Louisiana, one loblolly pine seed orchard each in Mississippi and South Carolina, and one slash pine orchard in Florida during January-February 1977.

Effectiveness of incorporation of granules will be determined by applying blank flourescent granules prior to the actual test to a sample row of trees in each orchard and counting the number of granules not incorporated in a 3" x 12" area near each of 10 trees.

For determination of the effects of the treatment on bird populations, the 30-acre block in each orchard will be searched under supervision of U.S. Fish and Wildlife personnel one day prior to and 1, 2, 3 and 5 days post treatment for dead birds and identification of birds utilizing the area.

Efficacy data will be collected by making post season cone insect damage counts on two ramets of six selected clones in each Furadan® Pow'r Till treated, Furadan® hand treated, and untreated areas in each orchard. To assess seedbug damage, seeds from caged and uncaged cones on sample trees will be extracted and x-rayed by

the Eastern Tree Seed Laboratory, Macon, Georgia. In addition, 10 percent of the conelets and cones will be tagged and monitored monthly on sample ramets as above for a two-year period in two federal orchards. The same treatment will be applied to sample trees in these orchards in January-February 1978. The study should be completed by October 1978.

(DeBarr and Nord - Georgia)

Second-stage nymphs of the leaffooted pine seedbug, *Leptoglossus corculus* (Say), were highly susceptible to most of the 32 candidate insecticides included in our contact toxicity tests. Twenty-four chemicals had LD_{50} dosage levels of less than 5 micrograms/gram of body weight in topical applications. In decreasing order of toxicity, aminocarb, monocrotophos, carbofuran, azinphosmethyl, aldicarb, dicrotophos, and propoxur killed 90 percent of test insects at a dosage level of less than 1 microgram/gram of body weight. There was good agreement between the relative toxicity of insecticides applied topically to the leaffooted pine seedbug in laboratory tests and the effectiveness of several insecticides previously tested in the field.

(DeBarr -Georgia)

In the early 1970's, tree improvement workers and seed orchard managers were hampered by the almost complete lack of registered insecticides for use in seed orchards. Forest entomologists had shown that insects often destroy more than half the seed crop in orchards across the South. Applied controls were sorely needed, but none were available.

In September 1972, an ad hoc committee called the Southern Seed Orchard Pest Committee was organized. The members of this committee had recognized that only through a united effort would it be possible to collect the extensive efficacy data required by the Environmental Protection Agency and register commercial insecticides for use in seed orchards.

Our first chairman was Loyd Drake, an entomologist with State and Private Forestry. Bob Weir, North Carolina State University, assumed the role of chairman in 1974. Other members and the agency or interest they represent included:

Larry Barber, U.S. Forest Service, State and Private Forestry;
Paul Barnett, Tennessee Valley Authority;
Dr. Walter Beers, University of Florida Tree Improvement Cooperative;

Terrell Brooks, states not in cooperatives;
Tom Flavell, USFS, State and Private Forestry;
Dr. William Neel, university forest entomologists;
William Tuttle, U.S. Forest Service, Region 8;
Dr. Hans van Buijtenen, Western Gulf Tree Improvement Cooperative;
and myself, U.S. Forest Service, Southeastern Forest Experiment Station.

The first task our committee undertook was to obtain efficacy data to support an extension of the registration for Guthion®, which was limited to slash pine orchards. Dr. Lawrence Abrahamson, pesticide specialist with the USFS, assisted the committee in this effort. In 1974 the EPA registered Guthion® for coneworm control on all species of southern pines.

Even before the Guthion® registration had been extended, we set out to find an alternative for Guthion®. We felt that finding a substitute for Guthion® was of major importance because of its high toxicity and the necessity for 3 to 5 Guthion® applications each year. Carbofuran (Furadan®) had shown promise for coneworm control in several 1973 research tests and was less hazardous when absorbed through the skin. The committee decided that testing should be initiated using a standardized study plan designed to evaluate the effectiveness and phytotoxicity of Furadan® in southern pine seed orchards.

Cooperators installed tests in 11 seed orchards in 1974, and in 1975 the Southwide Furadan® tests were expanded with 19 additional orchards. In late March 1976, I completed the summary and analysis of data from two years of testing. Chairman Weir forwarded these data to the manufacturer, and by mid April, FMC had applied for an amended registration of Furadan® 10G granules to control coneworms, seedbugs, coneborers, and the white pine cone beetle in seed orchards. In late July 1976, almost 4 years after the formation of the Southern Seed Orchard Pest Committee, the EPA registered Furadan® for seed orchard use. The tentatively approved label reads as follows:

> Directions for Use: Southern pine seed orchards for control of seedbugs, coneworms, and coneborers. Use Furadan® 10G granules at 4 to 8 ounces per inch of tree diameter. Broadcast within the drip area of the tree and incorporate with a suitable device. Make 1 application in winter or early spring. In white pine seed orchards for the white pine cone beetle, use Furadan® 10G granules at 8 ounces per inch of tree diameter. Do not graze or feed orchard plants or plant parts.

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