

**Abstracts of Publications and Research
Department of Agronomy and Soil Science
College of Tropical Agriculture
1960-1974**

II. Crop Science

Peter P. Rotar, Editor

PREFACE

This series of six volumes of *Abstracts of Publications and Research, Department of Agronomy and Soil Science, College of Tropical Agriculture, 1960-74* details all the published research by members of the Department of Agronomy and Soil Science, University of Hawaii, and graduate student M.S. theses and Ph.D. dissertations prepared for degrees granted by the Department.

The volumes in this series include:

- I. Crop Science—(1) Crop Breeding, Genetics and Tissue Culture; (2) Crop Physiology and Metabolism; and (3) Crop Quality and Utilization (DP 27)
- II. Crop Science—(4) Crop Ecology, Production and Management (DP 28)
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Within each numbered section, the publications are listed in alphabetical order by senior author and date of publication, then by alphabetical order of second author, and finally by alphabetical order of title. Abstracts of theses and dissertations are longer than abstracts of published papers. The table of contents in each volume lists the complete citation—author, date, title, and publication data—for each publication.

Each abstract may be cut out and individually mounted on a 5 x 8 notecard for easier filing.

The choice of category for certain abstracts may appear somewhat arbitrary, especially since some abstracts fit well into any one of several sections. Choice of section was made by the compiler. Not all of the department's research efforts are presented in these reports: some were inadvertently missed; others fell by the wayside as deadlines were set and changed. These will all be published in an addendum at a later date.

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P.P.R.

The Editor

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II. Crop Science

Peter P. Rotar, Editor

(4) Crop Ecology, Production and Management

Adlan, H. A. 1969. Effect of pH, silicon and phosphorus treatments on growth and yield of papaya (*Carica papaya* L.). Ph.D. Dissertation, Department of Agronomy and Soil Science, University of Hawaii.

ABSTRACT

Field and laboratory experiments to evaluate pH, silicon and phosphorus effects on papaya were conducted on the island of Kauai on an aluminous ferruginous latosol. The main plots were soil pH 5, 6 and 7; subplots were Si levels 0, 833 and 1166 kg per hectare. Three P levels; 0, 560 and 1120 kg per ha, were superimposed on the Si subplots to comprise a 3x3x3 factorial design with three replications.

With addition of P there was a highly significant ($p=0.01$) increase in plant height with age. Growth was suppressed in zero-P treatments, culminating in death of the plants. Silicon treatment produced a very limited growth response. At pH 7 plant growth increased significantly ($p=0.05$). In general, growth was highly influenced by the relative sufficiencies of lime and P. Although analysis of variance indicated no significant effect of Si, multiple regression equations revealed a positive effect of Si at later stages of growth.

Papaya fruit yields showed a highly significant (0.01 level) increase with P treatment and a significant (0.05 level) increase with higher pH levels. This was true for both total yield and marketable yield. A trend for increased yield with Si treatment was indicated but it was below the level of significance. Papaya yield for 6 months increased from one month to the next under all levels of treatments. Papaya trees in the zero-P treatment produced almost no fruit during the harvesting period.

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The effect of Si on P utilization by plants was such that at pH 5, leaf P increased with application of the first increment of Si when P was applied as a soil treatment, but decreased at the higher rate of Si application. Silicon did not affect availability of the native soil P. The multiple regression equation again revealed a close relationship between P, Si and Ca.

Calcium increased in both blades and petioles with age. Generally calcium was higher in the blade than the petiole. Within any one tissue there was a general trend of increased Ca concentration with increased P application. This was more true at high pH. Calcium concentration in the leaf also tended to increase with increase in pH.

In the soil, exchangeable Ca values increased with increase in soil pH. Soil extractable Si increased with increased Si treatment; within one Si treatment extractable soil Si increased with increased P application. Silicon increased from pH 5 to pH 6 and then decreased from pH 6 to pH 7. In zero P treatments, soil Si remained constant throughout the whole range of sampling interval. There was a tendency for extractable Si to decrease with time. Silicon application did not affect the native soil P but with increasing P, Si seemed to cause an increase in extractable soil P.

Sampling whole plants at flowering indicated similar patterns of nutrient accumulation in the stem and petiole. Phosphorus, Si and Ca increased in all tissues with increasing treatments. Dry weights of whole plants increased with increase in all treatment levels. Phosphorus showed a marked effect on decreasing the number of days to flowering and a significant correlation was indicated between P treatment levels and days to flowering ($r=-0.72$). Total nutrient uptake at flowering by the papaya was calculated in kg per ha. The uptake, in ppm, of the added nutrients increased with increased nutrient levels as well as with higher pH.

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Fruit quality, as determined by pH of fruit juice, titrateable acidity, Brix percentage and Brix acid ratio, revealed no significant difference with treatment. However, multiple regression analysis revealed that soil pH level accounted for 19% of the variation appearing in the equation for pH of fruit juice. Brix percent as a measure of fruit maturity in papaya was tentatively suggested to be about 11.5.

The petiole was more sensitive to Si treatment than the blade. Silicon concentrations in both petioles and blades increased with increasing pH and P applied. At pH 5 the petiole contained a Si concentration range from 0.04 percent Si where no Si was applied to a high of 0.17 percent with the highest rate of Si application 3 months after planting. During the same time the blade showed no trend for Si concentration. This pattern for Si concentration was observed in all pH levels. Silicon concentrations in both petiole and blade increased with increasing pH; the petiole concentration increased from 0.04 percent at pH 5 to 0.05 at pH 6 and 7 when no Si was applied at the first sampling date, while blade concentrations increased from 0.12 at pH 5 to 0.14% at pH 7. Silicon increased in both petiole and blade with higher P treatment. Multiple regression analysis indicated Si could account for part of the variation encountered in P determination.

When no P was applied, P concentrations were more or less the same in both the petiole and the blade with the blade showing a slightly higher percentage than the petiole throughout the entire sampling period. In the zero-P treatment the P concentration remained more or less constant throughout the whole pH range; with addition of the first P increment, P concentrations increased from pH 5 to pH 6 and then either remained constant or showed a slight drop at pH 7, which could be the result of dilution effect because of a high growth rate at this pH. The same trend occurred with application of 1120 kg of P per hectare. With increased P application there was an increase in P concentration of the petiole and blade.

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A relationship was established between incidence of *Phytophthora parasitica* blight of papaya and pH 6; therefore, avoiding pH 6 under Kauai conditions was recommended.

This study stressed the fact that tissue analysis, visual symptoms and soil analysis are useful and complementary in nutritional study of papaya. Recommendations are suggested for growing papaya on the Humic Ferruginous Latosols of Kauai.

additional index words: plant analysis, soil analysis, fertilization, phosphorus fertilization, silicon, crop yield, papaya, latosols, calcium concentration

Barmettler, E. R., D. L. Plucknett, H. F. Clay, and S. T. Hata. 1966. The Armed Forces' market for agricultural products in Hawaii. Univ. of Hawaii Agr. Econ. Rep. 68. 86 p.

ABSTRACT

This report covers the results of a lengthy survey completed among military purchasing agencies as well as wholesalers and farm produce outlets doing business in Hawaii. The purpose of the survey was to determine what the military requirements were for agricultural products in Hawaii, and to determine the causes for the fact that little purchasing of Hawaii produce was being done by the military. Early in the survey it was obvious that the military needs and wishes to purchase as many locally-produced commodities as possible, and that the reasons for few local purchases were partly the fault of the military and partly the fault of the local producers and wholesalers. Also, the survey showed that the potential market for local goods was very large and lucrative for local producers. Recommendations were made which would lead to increased local purchases; these included: more notice by the military as to their needs for certain items, with enough lead time to allow farmers to get into production; signing of firm marketing and purchasing contracts for certain items; strict enforcement of contracts in order to establish credible relations between the two groups, and other recommendations.

additional index words: fruits, vegetables, beef, pork, poultry, eggs, milk, contracting, marketing

Bown, T. A., C. Lyman, and P. P. Rotar. 1966. Buffelgrass. Univ. of Hawaii, Coop. Ext. Serv., Conserv. Leaf. 100.

ABSTRACT

A brief discussion on the use, description, adaptation in Hawaii and methods of establishment and management is given.

additional index words: buffelgrass, grasses, forages, tropical pastures, pasture management

Bown, T. A., C. Lyman, and P. P. Rotar. 1966. Cocksfoot or orchardgrass. Univ. of Hawaii, Coop. Ext. Serv., Conserv. Leaf. 109.

ABSTRACT

A brief discussion on the use, description, companion legumes, adaptation in Hawaii and methods of establishment and management is given.

additional index words: cocksfoot, orchardgrass, clover, grasses, forages, pastures, pasture management

Bown, T. A., C. Lyman, and P. P. Rotar. 1966. Kikuyugrass. Univ. of Hawaii, Coop. Ext. Serv., Conserv. Leaf. 103.

ABSTRACT

A brief discussion on the use, description, companion legumes, adaptation in Hawaii, and methods of establishment and management is given.

additional index words: kikuyugrass, grasses, big trefoil, forages, tropical pastures, pasture management.

Bown, T. A., C. Lyman, and P. P. Rotar. 1966. Paragrass or californiagrass. Univ. of Hawaii, Coop. Ext. Serv., Conserv. Leaf. 106.

ABSTRACT

A brief discussion on the use, description, companion legumes, adaptation in Hawaii and methods of establishment and management is given.

additional index words: paragrass, californiagrass, grasses, forages, tropical pastures, pasture management

Bown, T. A., C. Lyman, and P. P. Rotar. 1967. Whiteclover. Univ. of Hawaii, Coop. Ext. Serv., Conserv. Leaf. 112.

ABSTRACT

A brief discussion on the use, description, companion grasses, adaptation in Hawaii, and methods of establishment and management is given. Special emphasis is made on the use of the proper Rhizobium inoculant for each legume.

additional index words: whiteclover, legumes, forages, subtropical pastures, pasture management

Britten, E. J. 1961. An interesting growth relationship between two specimens of Erythrina sandwicensis. Amer. Mid. Nat. 66:504.

ABSTRACT

An observation was made about two wiliwili trees growing on Haleakala, one with bright orange flowers and one with pale yellow flowers, in which a branch of the yellow-flowered tree was completely encased by a forked branch of the red-flowered tree. It was speculated that the encasement may possibly be joined by a natural graft.

additional index words: Erythrina, wiliwili, grafts, flowering trees

Britten, E. J. 1962. Evaluation for pasture purposes of some African clovers in a plant introduction program. J. Range Mgmt. 15:329-333.

ABSTRACT

Eleven species of Trifolium of African origin are characterized as to their phenology, longevity, and habit of growth. A discussion of these characteristics is given in relation to selection for different genetic traits which may be utilized in a breeding program for improvement of pasture species.

additional index words: plant breeding, selection, clovers, pasture management

Britten, E. J. 1962. Hawaii as a natural laboratory for research on climate and plant response. Pac. Sci. 16:160-169.

ABSTRACT

The Hawaiian Islands are in the northern fringe of the tropics. Elevations range from sea level to over 13,000 ft. Mean annual temperatures associated with differences in elevation compare with those ranging from southern Florida to Maine. By selection of elevation, desired temperature conditions may be secured. The unique conditions obtained by a high oceanic island can be utilized for research on plant response to climate.

Details of air and soil temperatures are given for different locations at different elevations. Comparisons are made between two Temperate Zone stations with a location in the islands. Rainfall patterns are discussed and attention is drawn to a situation where rainfall remains constant but temperature changes with elevation from sea level to high elevation. Utilization of such conditions in conjunction with controlled environment cabinets makes possible integration of field and laboratory experiments.

additional index words: Hawaii, climate, environment, plant analysis

Britten, E. J., and C. T. Wallis. 1964. Alfalfa variety trials under irrigation. Hawaii Farm Sci. 13:6-7.

ABSTRACT

Ten alfalfa varieties were harvested 18 times over a 2 year period at the Kekaha Plantation on the island of Kauai. The best yielding varieties, African, Moapa, and Indian, yielded nearly two thirds more than the lowest yielding varieties, Talent and Lahonten.

additional index words: alfalfa, crop yield

Campbell, C. M., C. W. Garcia, J. C. Nolan, Y. N. Tamimi, and H. M. Richards. 1970. Effects of a program for pasture fertilization in the subtropics of Hawaii. Proc. West. Sec. Amer. Soc. Ani. Sci. 21:297-302.

ABSTRACT

The effect of fertilizer recommendation based on results of plot research on production of beef on kikuyugrass was investigated. The site was Kahua Ranch on the island of Hawaii. The soil is a Hydric Dystrandept. One paddock was control with 29.6 hectares while the fertilized paddock was 23.9 hectares. The fertilizer consisted of 2.77 tons (metric)/ha lime, 11.4 kg/ha copper, 7.1 kg/ha boron and 364 kg/ha nitrogen in split applications. Animal weight gain in the control for a period of 487 days was 168 kg/ha and 673 kg/ha for the fertilized paddock. Forage production increased from 5,181 kg/ha on the control to 12,521 kg/ha on the fertilized paddock. Average daily gain per animal increased from .42 kg/day for the control pasture to .57 kg/day on the fertilized pasture.

additional index words: beef production, fertilizers, pastures, forages, kikuyugrass

Campbell, C. M., C. W. Garcia, J. C. Nolan, Jr., Y. N. Tamimi, and E. G. Ho-a. 1971. Beef production from fertilized kikuyugrass pastures in Hawaii. Proc. West. Sec. Amer. Soc. Ani. Sci. 22:95-100.

ABSTRACT

Forage production and animal performance on nitrogen fertilized kikuyugrass paddocks were studied under subtropical conditions in Hawaii. The rates of applied nitrogen were 0, 84, 168 and 336 kg/ha/yr. A graze and rest system of forage utilization was used throughout the trial. Forage dry matter yield was increased from 12.4 to 27.0 tons (metric)/ha due to 336 kg/ha of nitrogen. The percent dry matter in the control forage was significantly higher than that in the nitrogen fertilized forage, 20.1% vs 14.7%. Crude protein, potassium and magnesium content increased from nitrogen fertilization and nitrogen free-extract and gross energy decreased. Due to nitrogen fertilization a higher stocking rate (2.91 vs 9.38), larger average daily gain (.667 vs .776 kg), and more live weight increase per hectare (324 vs 1216 kg/ha) were produced.

additional index words: forages, beef production, grasses, plant nutrition, animal nutrition

de la Pena, R. S., and D. L. Plucknett. 1967. The response of taro (*Colocasia esculenta* (L.) Schott) to N, P, and K fertilization under upland and lowland conditions in Hawaii. Proc. 1st Int. Symp. Trop. Root and Tuber Crops I(II):70-85.

ABSTRACT

Results of experiments involving N, P, and K fertilization on upland and lowland taro are presented. In lowland taro, yields were significantly increased by applications of N and P but no significant yield increases were obtained from the K plots. In upland taro, N, P, and K increased yields significantly. Rates used were 0, 280, 560, and 1120 kg/ha of N, P, and K applied in three separate tests.

Analyses of plant and soil samples showed that both can be used to evaluate fertilizer requirements of taro except the method using total soil N.

additional index words: fertilization, taro, plant analyses, soil analyses

de la Pena, R. S. 1970. The edible aroids in the Asian-Pacific area. Proc. 2nd Int. Symp. Trop. Root and Tuber Crops 1:136-140.

ABSTRACT

The importance of the edible aroids in the diet of the inhabitants of the Asian-Pacific area was discussed. Problems of production and potential of each crop in solving food shortages were presented, together with nutritive values of the crops which make them very important as a substitute for cereals.

The crops discussed with their geographical extent of cultivation are Colocasia esculenta (taro), Xanthosoma sagittifolium (tannia), Cyrtosperma chamissonis, Alocasia macrorrhiza, and Amorphophallus campanulatus.

additional index words: aroids, taro, tannia, crop production, subsistence agriculture

Escalada, R. G. 1973. Tillering and ratoon cropping of grain sorghum (Sorghum bicolor (Linn.) Moench). Ph.D. Dissertation, Department of Agronomy and Soil Science, University of Hawaii.

ABSTRACT

Studies on sorghum ratooning were conducted at the Hawaii Agricultural Experiment Station, Kauai Branch and at Kilauea, Kauai to investigate the tillering behavior of grain sorghum as affected by genotype and environment and to evaluate the effects of crop management on ratoon crops.

Ten sorghum hybrids were ratooned several times under three heights of cutting (3, 8, and 13 cm). Significant differences were observed among varieties, cutting heights, and variety x cutting height interactions. Hybrids NK 300A, NK 300, and ~~Mial-milo~~ Br 54 produced grain yields of 5112, 4082, and 3929 kg/ha, respectively while hybrid NK 265 yielded the lowest with 1869 kg/ha.

Plant height was affected by tiller number per plant and plant population. The plants grew shorter as the plant density became greater due to intense competition for space, light, nutrients, and water.

More uniform productive tillers were observed at a stubble height of 8 cm than in the other cutting heights. Although low cutting height (3 cm) produced greater number of basal tillers which were uniform in growth, disease organisms easily entered and penetrated the short stubble shortly after harvest, thus infecting and killing the tiller buds. High cutting height (13 cm) resulted in uneven tillering. Adventitious roots were produced which often failed to reach the ground causing the death of tillers.

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Using the same cutting heights, 4 nitrogen rates (0, 100, 200, and 250 kg N/ha) were applied to the hybrid Pride 550 Br over several ratoon crops. Grain yields increased as N fertilizer increased. Higher N treatments (200 and 250 kg N/ha) at the high cutting height (13 cm) produced higher yields during winter. Lower cutting heights (3 and 8 cm) with high N application performed better in summer.

Growing 6 sorghum hybrids under 8 plant populations showed that high grain and stover yields were obtained in high populations of more than 200,000 plants/ha. Despite shorter heads and fewer grains per head, these were compensated for by more plants per unit area. The same trend was observed in stover yield. Use of high population was made possible by utilizing newly-developed varieties which were bred for high planting density.

Leaf diseases, Sorghum rust (Puccinia purpurea), Fusarium stalk rot (Fusarium solani) and red stalk rot or anthracnose (Colletotrichum graminicola) proved to be very serious in the crop at high plant populations.

Different shading treatments were used in the field while growth chambers were used to control light and temperature. With high temperature, short daylength, and low light intensity, tillering was hindered, grain and stover yields decreased, and plant maturity was delayed. Under low light intensities the plants were tall, weak and spindly, and developed small, narrow expanded leaves. Low light intensity decreased grain yield by increasing the number of degenerated spikelets at the reduction division stage. With limited light and low temperature, short-statured plants with few productive tillers bearing small heads with few grains were produced. Close leaf formation occurred resulting in a rosette form of foliage.

additional index words: nitrogen fertilization, tiller growth, grain yield, stover yield, varietal behavior, plant population

Ezumah, H. 1970. Miscellaneous tuberous crops of Hawaii. Proc. 2nd Int. Symp. Trop. Root and Tuber Crops 1:166-171.

ABSTRACT

A review of the morphology and uses of the less important "root" crops grown in Hawaii. These included polynesian arrowroot or pia, burdock, daikon, ginger, lotus root, ti, water-chestnut and yambean root. Acreages devoted to them are declining and some, such as pia, kudzu and water-chestnut, have become weeds of some economic importance. Most of the other root crops still under cultivation, with the exception of daikon, are restricted to small home gardens.

additional index words: tacca, polynesian arrowroot, burdock, daikon, ginger, lotus, Cordyline, water-chestnut, yam-bean, root crops

Ezumah, H. C. 1972. The growth and development of taro, Colocasia esculenta (L.) Schott, in relation to selected cultural management practices. Ph.D. Dissertation, Department of Agronomy and Soil Science, University of Hawaii.

ABSTRACT

Three irrigation methods, three land preparation methods and three population combinations were studied. Factorial combinations of water treatments, age, and nutrients were used to study individual plant response in pots. A cost analysis based on yield from the irrigation experiment and data from puddled flooded soil condition (population, 27×10^3 plants per hectare) was presented.

Corm yields were 25, 35 and 26 metric tons/ha at 7, 10 and 13 months under sprinkler irrigation; 27, 41 and 62 tons/ha under furrow and 33, 48 and 64 tons/ha for flooded soil at the same ages respectively. Flooding gave significantly higher total yields over sprinkler at all ages whereas significantly higher yield over furrow was obtained only at 10 months. The yield from furrow irrigation was 82% of yield from flooded plot and that from sprinkler was 75% at 7 months. Corresponding percent yields at 10 and 13 months from the sprinkler and furrow irrigated plots were 75 and 85; and 41 and 97. Corm yield per hectare increased with increasing population. Yield per plant increased as population decreased. The contribution of sucker corms to total yield per plant increased as plant population decreased, while sucker yield per hectare increased as population increased. Suckering was not enough to compensate for increases in yields due to increasing population per hectare. Sucker yield was highest in flooded soil and decreased with decreasing water level. Effect of ridging ranged from 94% to 101% of yields obtained from non-ridged plots. Puddling of soil was not essential in taro growth. Yield from unpuddled flooded soil ranged from 92 to 106% of yield from puddled, flooded soil. Corresponding yields from unpuddled furrow and sprinkler irrigated plots were 88 and 92%; and 65 and 58% respectively.

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Plant height and leaf growth approached a maximum between 4 and 5 months irrespective of irrigation and land preparation methods. Leaf area increased as follows: flood > furrow > sprinkler. The best linear relationship of leaf area with yield was obtained at 3 months ($r = 0.83^{**}$) and not at 5 and 10 months ($r = 0.56^{**}$). Leaf production at 5 months in excess of amounts required for optimum corm yield was demonstrated. Maximum leaf area indices (LAI) obtained at 5 months were 6.9, 6.2 and 4.7 respectively for flooded, furrow and sprinkler irrigation. Regression of corm yield and LAI showed that LAI approached 3.0 for optimum corm yield. A distinct optimum was established at this value in the sprinkler treatment while a plasticity in LAI and yield was observed in the furrow and was extreme in the flooded culture.

Compared with returns from puddled flooded culture, relative incomes at 27×10^3 plants per hectare were as follows: Sprinkler 52-68%, furrow 72-87%, flooded unpuddled 70-96%.

Owing to higher rate of senescence of leaf growth, the N, P, Ca, Mg, Fe and Mn concentrations of taro petiole at 6 months were higher under the sprinkler and furrow irrigation than in flooded samples. These were no differences at 3 months. The N, K, Fe and Mn concentrations at 3 and 6 months were significantly higher under ridged culture in contrast with non-ridged culture. Based on 2-months vegetative growth in a pot study, increases in yield due to application of N and P at 800 and 1200 kg/ha under non-flooded culture was not enough to offset the difference in growth due to flooding. Restricted root growth and penetration were among factors limiting taro growth under non-flooded culture in the pot study.

additional index words: rowspacing, lowland taro, upland taro, irrigation practices, leaf area indices, corm yield, paddy crops

Golingai, S. 1972. Effect of nitrogen and harvest date on growth and yield of ratooned grain sorghum (Sorghum bicolor (L.) Moench). M.S. Thesis, Department of Agronomy and Soil Science, University of Hawaii.

ABSTRACT

Grain and stover yields were significantly increased with applications of 112 and 224 kg N per ha. Crude protein content of stover and grain increased with increasing rate of N application. Increased grain yield of ratooned sorghum was attributed to increase in yield components including tiller number at harvest, grain number and 1000-seed weight. N applications induced early flowering. Maximum grain yields for three crops of ratooned grain were obtained in the range of 35 to 43 days after 80% flowering and with 35-50% panicle moisture. There were significant season by days-to-grain fill interactions. Stover yields were higher at earlier harvest dates.

Percentage crude protein in grain and stover was reduced as the crop matured. This reduction in % CP was made up for by increase in grain weight as the crop matured.

Harvest date had a significant effect on regrowth of tillers. Early harvests, 15 to 20 days after 80% flowering produced better tiller regrowth.

additional index words: crop maturity, tiller-regrowth, physical maturity, stover yield, grain yield

Ito, P. J., Y. N. Tamimi, and H. Kikukawa. 1969. The effect of wildcane windbreak on cucumber and sweet corn at Lalamilo. Hawaii Farm Sci. 18:9-12.

ABSTRACT

Wildcane (Saccharum spontaneum var. moentai) was used as a windbreak for cucumber and sweet corn. Yield of these two crops decreased with increasing distance from the windbreak. Significant reductions in yield occurred at distances of 4 times the height of the windbreak.

additional index words: wildcane, windbreaks, vegetable crops

Kratky, B. A., and Y. N. Tamimi. 1974. Potato response to phosphorus rates and placement and a windbreak. Hawaii Farm Sci. 23(2):10-13.

ABSTRACT

Broadcasting phosphorus or a split application of broadcast plus banding on a Hydric Dystrandep have higher yield of potatoes than banding alone. Banding alone should not be considered for this type of soil unless the level of soil P is high. Yield increased as the amount of phosphorus added increased, even at 480 lb/A rate, and further yield increases could be expected with additional phosphorus applications. Potato yield and soil moisture decreased with increasing distance from 15-20 ft. high wild olive windbreak.

additional index words: windbreaks, vegetable crop production, potatoes, phosphorus fertilization

Larson, A. G., R. E. Green, L. B. Rankine, and R. R. Romanowski, Jr. 1966. Progress report on the Molokai Demonstration Farm of the University of Hawaii for the 1963-64 fiscal year. Hawaii Agr. Exp. Sta., Tech. Prog. Rep. 151. 23 p.

ABSTRACT

The report summarizes preliminary estimates of cost of production, yield, and marketing cost for a number of vegetables produced on the Molokai Demonstration Farm. Eggplant, tomatoes, bell peppers, cucumbers, and zucchini squash were grown in one-fifth acre plots using practices recommended by the College of Tropical Agriculture. A comparison of trellised and prone tomatoes showed the superiority of trellising, which yielded 50 tons tomatoes per acre, almost 6 times the yield of nontrellised tomatoes. Eggplant and zucchini squash also appeared to be profitable crops.

additional index words: vegetable production, agricultural economics, crop management, marketing

Lyman, C., P. P. Rotar, and T. A. Bown. 1966. Bermudagrass. Univ. of Hawaii, Coop. Ext. Serv., Conserv. Leaf. 107.

ABSTRACT

A brief discussion on the use, description, companion legumes, adaptation in Hawaii and methods of establishment and management is given.

additional index words: bermudagrass, forages, grasses, tropical pastures, pasture management

Lyman, C., P. P. Rotar, and T. A. Bown. 1966. Green panicgrass. Univ. of Hawaii, Coop. Ext. Serv., Conserv. Leaf. 101.

ABSTRACT

A brief discussion on the use, description, companion legumes, adaptation in Hawaii, and methods of establishment and management is given.

additional index words: green panicgrass, grasses, forages, tropical pastures, pasture management

Lyman, C., P. P. Rotar, and T. A. Bown. 1966. Pangolagrass. Univ. of Hawaii, Coop. Ext. Serv., Conserv. Leaf. 104.

ABSTRACT

A brief discussion on the use, description, companion legumes, adaptation in Hawaii and methods of establishment and management is given.

additional index words: pangolagrass, digitgrasses, grasses, forages, tropical pastures, pasture management

Lyman, C., P. P. Rotar, and T. A. Bown. 1967. Big trefoil. Univ. of Hawaii, Coop. Ext. Serv., Conserv. Leaf. 113.

ABSTRACT

A brief discussion on the use, description, companion grasses, adaptation in Hawaii, and methods of establishment and management is given. Special emphasis is made on the use of the proper Rhizobium inoculant for each legume.

additional index words: big trefoil, lotus, legumes, forages, subtropical pastures, pasture management

Lyman, C., P. P. Rotar, and T. A. Bown. 1967. Koa Haole. Univ. of Hawaii, Coop. Ext. Serv., Conserv. Leaf. 110.

ABSTRACT

A brief discussion on the use, description, companion grasses, adaptation in Hawaii, and methods of establishment and management is given. Special emphasis is made on the use of the proper Rhizobium inoculant for each legume.

additional index words: leucaena, legumes, forages, tropical pastures, pasture management

McCall, W., G. T. Shigeura, and Y. N. Tamimi. 1969. Windbreaks for Hawaii. Univ. of Hawaii, Coop. Ext. Serv., Circ. 440. 20 p.

ABSTRACT

A description of several types of windbreaks and their proper utilization for farms, homes, public recreational areas and for ranches.

additional index words: windbreaks, recreational areas

Moore, D. G., and E. J. Britten. 1964. A comparison of Rhizobium strains for effective nodulation in kenya clover (Trifolium semipilosum). J. Range Mgmt. 17:335-337.

ABSTRACT

It was shown that the common inoculum, strain B, which is very effective on Trifolium repens, white clover, is ineffective on kenya clover. Strain CB782 was found to be very effective on kenya clover. Practical results would indicate that it is always best to pick the proper Rhizobium for the legume in order to obtain effective nitrogen fixation.

additional index words: Trifolium, Rhizobium, inoculation, nitrogen fixation

Motooka, P. S., D. L. Plucknett, D. F. Saiki, and O. R. Younge. 1967. Pasture establishment in tropical brushlands by aerial herbicide and seeding treatments on Kauai. Hawaii Agr. Exp. Sta., Tech. Prog. Rep. 165. 18 p.

ABSTRACT

Steep wetland areas are prime candidates for conversion to tropical pastures in Hawaii. A 40 acre valley was cleared by aerial herbicide applications, followed by burning and aerial seeding and fertilization. Green panic (Panicum maximum var. trichoglume) established well as the major grass. Legumes which established successfully after seed pelleting with methyl ethyl cellulose and TVA slag were: stylo (Stylosanthes guayanensis) on exposed ridgetops and upper slopes; Desmodium intortum which established in valley bottoms and lower slopes; Glycine wightii which grew best within the driplines of dead trees and Centrosema pubescens which grew occasionally on the lower slopes. Experimental costs for clearing and establishment were \$100 per acre; costs for ranchers are estimated at \$80 per acre to first grazing.

additional index words: land development, tropical pastures, aerial seeding, aerial fertilization, aerial application of herbicides, legume seed pelleting, pasture grasses

Motooka, P. S., D. F. Saiki, D. L. Plucknett, O. R. Younge, and R. Daehler. 1967. Aerial herbicidal control of Hawaii jungle vegetation. Hawaii Exp. Sta. Bull. 140. 15 p.

ABSTRACT

Two trials were conducted to determine the feasibility of using aerial treatment of herbicides to clear brush from heavily infested jungle wetlands, and to evaluate some brush-clearing herbicides.

All of the herbicides tested were effective in varying degrees. Silvex was rated most effective in killing or retarding growth of the jungle species encountered in this study. However, single applications of any of the herbicides tested was shown to be inadequate in gaining complete control of persistent woody plants.

Grass planting appears to be readily feasible in the treated areas while the herbicides are still highly active on the jungle vegetation.

This study was the forerunner of a series of studies which have led to the development of a system of land clearing and conversion to tropical pastures in sub-marginal lands.

additional index words: brush control, aerial herbicide application, land conversion, tropical pastures, marginal lands

Motooka, P. S., D. F. Saiki, D. L. Plucknett, O. R. Younge, and R. Daehler. 1967. Control of Hawaiian jungle with aerially applied herbicide. Down to Earth. 23:1, 18-22.

ABSTRACT

Studies were conducted to evaluate several aerially applied herbicides for effectiveness on brush species that make up wetland jungles in Hawaii. Of the treatments included in the tests, silvex LV ester formulations showed the most promise and was chosen for a larger field trial to clear and reclaim a jungle wetland area for pasture. Other materials used included both rapid defoliants (paraquat) and hormone-type herbicides, including dicamba, picloram, 2,4-D and 2,4,5-T. Comparative results of herbicide application under wet versus dry weather conditions seem to show that effectiveness is higher under relatively dry conditions. It is possible that the initial application would have been more effective with all treatments had they been made to dry foliage in a non-rainy period.

The tests reported here show that brush clearing via aerially applied herbicide is entirely feasible in Hawaii wetlands.

additional index words: land development, brush control, aerial seeding, herbicide residues, pasture management, herbicides

Motooka, P. S., D. L. Plucknett, and D. F. Saiki. 1969. Weed problems of pastures and ranges in Hawaii. Proc. Asian-Pacific Weed Interchange, East-West Center, University of Hawaii, p. 95-98.

ABSTRACT

Most serious weed problems in pastures and ranges are caused by poor management or encroachment by aggressive species which are difficult to control. Major species in order of weediness in Hawaii pastures are: guava (Psidium guajava), Lantana camara, Eupatorium riparium, Schinus terebinthifolius, Pluchea odorata, Eugenia cumini, Stachytarpheta sp., Melastoma malabathricum, Rhodomyrtus tomentosa, Rubus penetrans, Myrica faya, Trichachne insularis, and Caesalpinia sepiaria. To control range pests, a total management approach must be taken. This includes clearing of the lands to enable desirable species to grow and then managing to keep the balance in favor of these species. Clearing techniques used in Hawaii include herbicidal treatment, burning, mechanical clearing or a combination of these.

additional index words: pasture management, land development, weed control, herbicides, mechanical clearing, burning

ABSTRACT

Field and greenhouse experiments were conducted at the Hawaii Agriculture Experiment Station on Kauai from June 1970 to May 1972 to study the feasibility of overcoming phytotoxicity of preemergence herbicides to direct seeded rice (*Oryza sativa* L., var. IR8) by pelleting rice seed with an adsorbent. The effectiveness of adsorbent-pelleted seed was tested against three main herbicides: 3-amino-2, 5-dichlorobenzoic acid (amiben), 2-chloro-2', 6'-diethyl-N (butoxymethyl) acetanilide (CP 53619 or butachlor), and 2-tertiary butyl-4-2'-4'-dichloro-5'-isopropoxyphenyl-1,3, 4-oxadiazoline-5-one (RP 17623). The properties of these herbicides with regard to adsorption, leaching, site of uptake, sensitivity and inherent susceptibility of rice to the herbicides, and herbicide diffusion to coated and uncoated seed were also studied to determine some basis for obtaining herbicide selectivity using adsorbent-pelleted seed.

The phytotoxicity of the herbicides to direct seeded rice was greatly reduced by pelleting pregerminated rice seed with activated carbon Darco G-60 three times using 50% polyvinyl acetate as an adhesive. The performance of the carbon-pelleted seed was influenced by both management and herbicidal factors. The most important management factor were method and rate of sowing, time of flooding, time and rate of herbicide application, herbicide formulations, coating quality, and temperature during seedling establishment. The most effective sowing method was broadcasting the pelleted seed on nonflooded, puddled soil. Seed pelleting did not protect rice when it was sown in water or below the soil surface under upland conditions, due to lack of intimate contact between herbicide and adsorbent and/or to the presence of standing water which inhibited seedling growth.

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Evidence was presented to show that herbicide properties also influenced the effectiveness of pelleted seed. In general, activated carbon pelleting could not protect direct seeded rice from herbicides which are lethal to transplanted rice, since the survival of pelleted seed depended a great deal on the plant's ability to resist herbicide toxicity with increasing age. Activated carbon pelleting protected direct seeded rice from those herbicides which are lethal to germinating uncoated rice seed but not lethal to transplanted rice. The degree of protection, however, was dependent on herbicide adsorption on activated carbon and soil, the sensitivity of emerging seedlings to the herbicides, the rate of herbicide diffusion to rice seed, and the site of uptake of the herbicide. The adsorption efficiency of carbon coatings was influenced by the rate of herbicide diffusion and coating weight.

Seed pelleting as an approach to herbicide selectivity in direct seeded rice was most effective with CP 53619, but moderately effective with amiben and RP 17623. In this study RP 17623 was applied at the rate of 3.3 kg/ha or higher.

When 3 percent methiocarb (4-methulthio-3, 5-xylol N-methyl carbamate)--an experimental bird repellent--was incorporated in the carbon pellet, the coating could protect rice seed from birds as well. The toxicity of the insecticide to rice seed was also reduced by activated carbon.

CP 53619 and RP 17623 were selective to upland rice up to 4.48 kg/ha when uncoated rice seeds were planted at least 3 cm deep. Amiben and 2,4-dichlorophenoxy acetic acid isopropyl ester (2,4-D IPE) severely injured upland rice since they were easily leached in soil and very toxic to emerging seedlings.

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additional index words: 2, 4-D, amiben, methiocarb, butachlor, seed coating, seed protectants, phytotoxicity, activated carbon pelleting, plant protection, pesticides

ABSTRACT

Experimentation was conducted at the Hawaii Agricultural Experiment Station, Kauai Branch, on a steep, wetland area following jungle clearing, reseeding and fertilization. The objective of the experiment was to test the usefulness of the ecological approach to pasture research and management in such a land development system. The important phases of the research program included, the verification of evident distribution patterns of certain forage and weed species; the collection of vegetation and environmental data in order to relate these patterns of growth to gradients of environmental parameters; and the study of sward dynamics and productivity, identifying the weed species most reliably indicating sward degeneration.

Mapping of species distribution patterns was facilitated by the use of data collected from belt transects and aerial and ground photography. Of the improved forage species studied Stylosanthes guyanensis was the only species dominant at ridgetop locations and on the shallow soils of spurs and steep, eroded areas. From the multiple regression analysis, it was the higher soil pH and shallower soil profile that most aptly distinguished the conditions at these locations from those further down the slope. Another important community component at those sites was the weedy association of Paspalum conjugatum and Setaria geniculata. Its distribution also closely corresponded to the shallower soil profiles and lower soil moisture regimes. Of the other, more woody weed species found at these ridgetop locations, Melastoma malabathricum, Elephantopus mollis, Lantana camara and Stachytarpheta urticaefolia were the more dominant. They all showed distribution patterns closely related to water extractable soil silicon among other environmental parameters.

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At locations further down the slope and in the valley bottoms, the more productive sward of improved species was dominated by Panicum maximum (var. trichoglume) and Desmodium intortum. In the case of Panicum maximum, distribution was more reliably influenced by variations in soil moisture, soil nitrogen and exchangeable soil manganese. The distribution patterns of the forage legume, Desmodium intortum, more closely corresponded to the variation in total soil nitrogen and soil calcium. The weed species occurring most frequently at those sites were Commelina diffusa, whose occurrence was closely related to the lower soil pH conditions and Erechtites hieracifolia, which exhibited a more varied distribution pattern, corresponding to higher total soil nitrogen and soil moisture conditions.

Seasonal productivity of improved forage species and dominance of weed components were influenced by grazing management and a natural decline in soil fertility. The contribution of Panicum maximum (var. trichoglume) declined from 30% to 10% of the total forage yield of the sward, only to recover to its original dominance after an extended rest period during the winter months. Its annual dry matter yield averaged 7000 kgm/ha, going as high as 12,000 kgm/ha. A similar trend of productivity was exhibited by Desmodium intortum whose annual dry matter production approached 3000 kgm/ha or 15-20% of the total yield of the sward. Stylosanthes guyanensis was only readily utilized during periods of heavy grazing. The most reliable indicator of sward condition was the weedy grass association of Paspalum conjugatum and Setaria geniculata. After each heavy grazing period the contribution of this association increased, only to decrease when the more vigorous forage species responded to the rest period. Under the conditions of these humid wetlands, other weed species such as Lantana camara, Psidium guajava, Elephantopus mollis, Commelina diffusa, Erechtites hieracifolia, Cuphea carthagenensis and Ageratum conyzoides were also excellent indicators of environmental conditions favoring the decline in productivity of improved forage species.

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No clear pattern of seasonal liveweight gain by the grazing animals was evident, except for the drop in production during the wet season and during the stress periods of summer.

additional index words: grazing animals, vegetation measurements, species distribution, forages, grasses, legumes

ABSTRACT

The yield of sugar cane is analyzed in relation to climate, soil and management. Detailed information is obtained from the Waialua Sugar Company Inc. on Oahu, where approximately 4200 ha of irrigated sugarcane are grown under fully mechanized conditions. The field records date back to 1930, but a selected group of data for the period 1960-1970 has been used for statistical interpretation. Management variables include month of harvest, crop cycle, age in months, nitrogen, potassium and phosphorus fertilization, amount of irrigation water applied and the number of days after the last round of irrigation until harvest. The climatic variables are rainfall during winter, rainfall during summer, rainfall one month before harvest; rainfall, maximum and minimum temperature and diurnal difference in temperature during the harvest month, average monthly evaporation and global radiation. The soils are mapped in detail and the yield data are grouped according to the major soil series on which sugar cane is grown in this plantation. Two soil series (Wahiawa and Lahaina) belong to the Order of the Oxisols and cover almost 50% of the terrain, while another 40% is classified as Haplustolls (Ewa, Waialua, Kawaihapai, Pelehu, and Haleiwa). The remaining 10% of the area belongs to poorly drained Inceptisols and Vertisols (Pearl Harbor and Kaena).

The seasonal variation in climate with warm sunny summers and cool rainy winters is one of the determining factors in sugar production. Heavy rainstorm in winter show a negative effect on the production. Age of the crop is negatively correlated when the yield is expressed as Ton Sugar per Acre per Month. A significant drop in yield is observed in ratoon cropping. This decrease was more pronounced in the lowland soils. Sugar yield from the first plant crop is

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higher than the yield from the second plant crop. Since all other management practices and climatic factors are similar for both plant crops, this drop in yield must be considered as a genuine yield decline.

During the 1930's the lowland areas produced more sugar than the fields located on chemically infertile Oxisols in the uplands. Increasing amounts of fertilizers since that time reduced the effect of the limiting fertility factor. The heavy machinery introduced since 1935 created poor physical conditions in the alluvial soils - impeded drainage, compaction and stickiness. The result is that during the last decade the Oxisols produced significantly more sugar than the alluvial soils in spite of less favorable climatic conditions at higher elevation. The limiting factor appears to have changed from fertility to physical conditions. An analysis of variance test clearly demonstrated the significant difference in yield between these two soil groups. From this study it becomes clear that all three systems-- climate, soil and management--play an important role in the final yield figure. While it is not possible to estimate the yield satisfactorily with only one of these systems--the explained variation in yield varied from 18% to 34%--the combination of the three systems explained more than 70% of the yield variation. Almost 80% of the estimated yield data differed less than 5% from the actual yield.

Because this study was carried out over a relatively large area and actual plantation records were used instead of an experimental design, the unexplained variation is still considerable. However this study indicates that agricultural research designed to interpret actual field data should give equal importance to the three systems that control crop growth: Climate, soil and management.

additional index words: soil fertility, plant-soil interactions, plant yield, crop cycles, sugar cane yield decline, ratoon cropping

Pancho, J. V., M. R. Vega, and D. L. Plucknett. 1969. Some common weeds of the Philippines. Weed Sci. Soc. Phil., Los Banos. 106 p. 86 fig.

ABSTRACT

This 106 page handbook with 23 references lists 88 weed species belonging to 25 families and grouped into three categories: Group I - Ferns (2), Group II - Dicotyledons (48), Group III - Monocotyledons (38). The species which are well illustrated, are arranged alphabetically in each group by their scientific names, along with their common names in major language regions in the Philippines. The objective of the authors in this type of presentation is not to show how plants are classified but "to facilitate the recognition" of weed species commonly infesting major Philippine crops. Both the scientific names and common names are indexed and a summary of information which includes scientific names, families, page numbers, and the crops infested, supplement the limited contents. A glossary of 46 terms is added to help nonbotanists understand the descriptive information given in the text.

additional index words: Philippine weeds, weeds of crop lands, weed identification

ABSTRACT

Descriptions and a key to each of the weedy members of the Melastomaceae family in Hawaii are presented. Common species are Tibouchina semidecandra, Melastoma decemflicum, and M. malabathricum. Of these, M. malabathricum is the most important weed species. Others of less importance are Clidemia hirta, Pterolepis glomerata, and Heterocentron subtriplinervium.

additional index words: brush weeds, aluminum accumulators, weed identification

Plucknett, D. L., J. C. Moomaw, and C. H. Lamoureux. 1963. Root development in aluminous Hawaiian soils. Pac. Sci. 17(4):398-406.

ABSTRACT

Roots of Rhodomyrtus tomentosa and Melastoma malabathricum were excavated in three soil series from the bauxitic area of Kauai. Root systems of R. tomentosa and M. malabathricum in Kapaa and Halii soils were very shallow, with tap roots turning laterally at shallow depth and with long lateral roots very close to the soil surface. Deeper tap-root penetration of R. tomentosa and M. malabathricum was observed in the Koolau soil.

Lime and phosphorus treatments were added to bauxitic subsoils of the Kapaa and Halii series in pots and Leucaena glauca (L.) was planted in the pots. Tap roots of L. glauca were stimulated by phosphorus treatment, but were restricted in untreated subsoils. Increased root development with phosphorus treatment seemed to be more related to phosphorus supply than to decreased aluminum effects. No evidence of root damage because of aluminum was found.

L. glauca roots were sectioned with a freezing microtome and stained, using hematoxylin without a mordant. Although all staining obtained could not be attributed to aluminum, since other metals can act as mordants for hematoxylin, intensity of staining was assumed to be related to aluminum concentration in the tissues. Cell walls, nuclei, and cytoplasm stained in all tissues, and outer walls of epidermal cells stained very heavily. Staining was more intense in roots from check and P-treated plants than in roots from lime-treated plants.

additional index words: bauxitic soils, tap-root development, liming, phosphorus fertilization, cell staining, Rhodomyrtus tomentosa, Melastoma malabathricum

Plucknett, D. L., and O. R. Younge. 1963. Sorghum varieties and hybrids in Hawaii. Hawaii Farm Sci. 12(2):4-6.

ABSTRACT

Forage sorghums at Kekaha Plantation Co. produced 4.7 to 5 ratoon crops per year under irrigation on coral sand soils. Fresh forage yields reached as high as 68 tons per acre with Haygrazer, and averaged 104 lbs. dry matter production per day for the same variety. At Kauai Branch Station, summer crops of several forage sorghums yielded over 120 lbs. per acre per day of dry matter. Bird damage was severe on grain sorghums. Perennial growth or ratooning was suggested as a major benefit of growing sorghum in tropical conditions. Ratoon growth could be important not only in increasing forage or grain yields per acre, but also in providing fast, growing, perennial windbreaks for vegetable farmers.

additional index words: production per acre per day, ratooning, bird damage, midge, forage, grain, sorghum

Plucknett, D. L., and O. R. Younge. 1964. Chemical weed control in mochi rice production. Hawaii Farm Sci. 13(1):8-10.

ABSTRACT

Excellent weed control and grain yields in rice were obtained by using propanil. No serious crop injury was apparent with the herbicide. With rates of 4 lbs or more of propanil, jungle ricegrass (*Echinochloa crusgalli*) was eliminated. Both broadleaf weeds and grass weeds were controlled throughout the growing period of the crop by a single spray application of the herbicide on young weeds, 12 days after planting the rice. Compared to transplanting and hand weeding of rice in the traditional way, the herbicide treatments gave yield increases ranging from 866 to 3121 lbs of unhulled rice, or net gains of 21 to 76%.

additional index words: propanil, jungle ricegrass, herbicides, weed control, rice

Plucknett, D. L., and O. R. Younge. 1967. A high lift machine for harvesting papaya. Hawaii Farm Sci. 16(2):1-3.

ABSTRACT

A harvesting aid for papaya was constructed using a fork-lift attachment on a Fordson tractor. This machine can lift a platform affixed with rails, and a crew of two men on the platform, in order to harvest trees as high as 22 feet. Using the machine, it was possible for three men to harvest 5 acres of experimental plots in one day. The machine can be constructed on the farm.

additional index words: labor saving, fruit harvesting, papaya

Plucknett, D. L. 1969. Use of herbicides in conversion and development of brush-infested tropical wetlands. Proc. 2nd Asian-Pacific Weed Control Interchange, Philippines. p. 570a-570k.

ABSTRACT

Many of the wetland areas of Hawaii present good opportunity for improvement for pasture, forestry, or recreation. Conversion systems are being developed using herbicides as tools in clearing noxious or weedy brush and trees. Aircraft applications are favored because of the rough topography and the extensive land areas to be cleared. Seeding or reseeding with desirable species and good management practices are essential ingredients of the conversion systems.

A pasture has been successfully established at low cost on Kauai using split applications of silvex, burning dead vegetation, aerial sowing and fertilization of tropical pasture species, followed by controlled grazing. At Hanalei, parts of a 2500 acre forest reserve which were burned accidentally in 1967 were aurally sown with pasture species to prevent reinfestation with weedy species. To complete the conversion, the lands were fertilized by air, and forest trees were planted. Selective herbicide injection and granular formulation treatments will be used in both these experiments to control weedy trees and shrubs.

additional index words: land development, aerial seeding, aerial fertilization, aerial herbicide applications, brush control

Plucknett, D. L., D. F. Saiki, and P. S. Motooka. 1969. Weed control in taro (*Colocasia esculenta*). Proc. Asian-Pacific Weed Interchange, East-West Center, University of Hawaii. p. 90-93.

ABSTRACT

Chemical weed control in taro is essential if the industry is to be modernized. Under improved management, existing lowland valleys could be converted from paddy to intermittent flooding or furrow irrigation, thus allowing mechanized planting and harvesting.

Most promising herbicides in lowland taro are: propanil, prometone, ametryne, and nitrofen (TOK). In upland taro tribluralin, prometryne, and ametryne have provided good weed control under upland conditions, but emergence of suckers was hampered by shading, and trapping by the plastic mulch.

additional index words: chemical weed control, flooding, paddy culture, plastic mulching, crop modernization, taro, herbicides

Plucknett, D. L. 1970. Productivity of tropical pastures in Hawaii. Proc. XI Int. Grassland Congr. p. A38-A49.

ABSTRACT

Hawaii pastures encompass a broad transect of soils, rainfall, and vegetation types from sea level, to about 3,000 m elevation. The environments vary widely from near-desert conditions at sea level on leeward coasts, to the high rainfall (1,500 mm) windward districts exposed to northeast trade winds, and to the arid, cold, highlands of the large volcanoes on the islands of Maui and Hawaii. Very high production with irrigated *Leucaena*-Guinea grass was obtained at 50 m elevation on the island of Kauai, where a 23 ha dairy and ranch produced 9,770 kg milk and 400 kg beef/ha annually over a 12-year period. In the high rainfall windward lowlands N-fertilized pangolagrass produced over 1,000 kg beef/ha per year. Major limitations on productivity include moisture, low winter temperatures, acid or infertile soils, forage quality, annual feed balance, and competition with undesirable species. Other livestock productivity data are given for each of the major ecological zones of the islands, along with information on the major pasture species used in each zone.

additional index words: vegetation zones, pasture grasses, pasture legumes, fertilization, beef production, dairy production, tropical pastures

Plucknett, D. L. 1970. Status and future of the major edible aroids: *Colocasia*, *Xanthosoma*, *Alocasia*, *Cyrtosperma*, and *Amorphophallus*. Proc. 2nd Int. Symp. Trop. Root and Tuber Crops. 1:127-135.

ABSTRACT

This review covers the major edible aroids, beginning by presenting botanical descriptions and taxonomic information on the major genera and species to reduce confusion. The habitat and culture of each genus is discussed, along with suggestions for future research or production methods. *Colocasia* and *Cyrtosperma*, because of their adaptation to flooded or swampy soils, may prove important in the future as food crops where other crops would not grow. The role of aroids in various cropping systems such as shifting or subsistence agriculture, intercropping and monoculture is discussed. The major problems and limitations of the aroids are discussed under the following headings: mechanization, weed control, plant diseases, insects and other pests, plant nutrition, nutritive value, breeding and improvement, corn storage, processing, and new uses. The author suggests that *Colocasia* and *Xanthosoma* may continue to be important in some regions, but that the other edible aroids will probably continue to decline in importance except in a few limited areas.

additional index words: taxonomy, flooded soils, coral atolls, subsistence agriculture, intercrops, monoculture, mechanization, insects, plant diseases, food value, breeding, aroids

Plucknett, D. L., ed. 1970. Tropical root and tuber crops tomorrow. Proc. 2nd Int. Symp. Trop. Root and Tuber Crops. 171 p.

ABSTRACT

This book contains part of the Proceedings of the Second International Symposium on Tropical Root and Tuber Crops. The papers cover a wide range of subjects, especially emphasizing the current status and future outlook for each major set of crops, both from a worldwide as well as a regional point of view. Thus comprised, the book represents probably the most complete compilation and review ever published on the tropical root and tuber crops. There are 49 papers in Volume I, and they are divided among the crops as follows: sweet potato-16; cassava-9; yams (*Dioscorea* spp.)-7; potato-5; the aroids-7; and general papers-5.

additional index words: root crops, tuber crops, agricultural economics, sweet potatoes, cassava, yams, potatoes, aroids

Plucknett, D. L., and R. S. de la Pena. 1970. Taro weed control. Hawaii Farm Sci. Vol. 19.

ABSTRACT

Several herbicides had given excellent weed control for upland and lowland taro when applied as pre-emergence herbicides either as spray or injected with the irrigation water. Best weed control with least injury to the upland crop, was obtained with 3 lbs. a.i./acre of ametryne, prometryne and nitrofen. In lowland, injection of nitrofen at 3 lbs. a.i./acre gave the best weed control with no crop injury. No foliage injury resulted from applications of herbicides through irrigation, because chemicals do not come in contact with the leaves.

additional index words: taro, weed control, herbicides.

Plucknett, D. L., J. P. Evenson, and W. G. Sanford. 1970. Ratoon cropping. Advances in Agron. 22:285-330.

ABSTRACT

A comprehensive review article covering the practice of ratoon cropping in such crops as sugarcane, sorghum, cotton, banana, pineapple, and others. Although little research has been done on ratooning, the higher yield potential for certain crops using ratoon systems of management serves to emphasize its importance. Clearly the ability to grow a healthy, long-lived root system is basic to ratoon cropping. Factors involved in ratooning include: genetic capabilities of the crop; tillering; root growth and longevity; effect of environment on perenniality; soil moisture, soil fertility, and soil compaction, influence of pests and diseases; and management factors such as harvesting method, postharvest field operations, and cropping systems.

additional index words: pineapple, sugarcane, cotton, banana, sorghum, rice, cropping systems, soil fertility, soil moisture, soil compaction, tillering, roots, weed control, insects, predators, plant diseases

Plucknett, D. L., O. R. Younge, T. Izuno, Y. N. Tamimi, and S. M. Ishizaki. 1971. Sorghum production in Hawaii. Hawaii Agr. Exp. Sta. Res. Bull. 143. 33 p.

ABSTRACT

A report which includes results on several sorghum variety trials at different locations in Hawaii. Results of fertilizer treatments, ratooning, root development and mineral constituents of forage and grain sorghum varieties are also reported.

additional index words: sorghum, sorghum fertilization, ratooning

Puri, K. D. 1969. Sampling variability in, and relevance of, cane maturity indices. M.S. Thesis, Department of Agronomy and Soil Science, University of Hawaii.

ABSTRACT

A cane maturity study evaluated the sensitivity of several cane maturity indices and explored the possibility of developing an easily sampled, sensitive index of cane maturity. Primary stalks (primaries), first season suckers (1st S.S.) and second season suckers (2nd S.S.) were sampled for sheath moisture, 8-10 internode moistures, 8-10 internode sucrose/reducing sugar ratio, top/bottom ratio (T/B ratio), and pot ratio of each third of the stalk. Sampling variability was evaluated from pot ratio data.

Variability within stalk orders increased in the order primaries, 1st S.S., and 2nd S.S., however no coefficient of variation exceeded 15%. The pot ratio of 2nd S.S. was greater than for 1st S.S. but adjacent stools and the sampling sites did not differ. Pot ratio of thirds of the stalk were significantly correlated with the pot ratio of the whole stalk. Several of the maturity indices were correlated with stalk order pot ratio but values were much lower than fractional stalk pot ratio values. The correlation between the pot ratio of the top third, or the whole stalk, on stalk order, increased with increasing maturity while those for the bottom decreased. Correlations between parts of the stool and the whole stool indicate that primaries and 1st S.S. were the best estimators of stool pot ratio. The top, or top plus middle, of primaries and 1st S.S., may provide a more sensitive index of maturation than a combination which includes the stool bottom.

additional index words: sugar cane, maturity indices, sampling methodology

Quintana, R. U. 1966. The effect of planting date, nitrogen level and plant density on soy bean (*Glycine max* (Linn.) Merr.) seed yield. M.S. Thesis, Department of Agronomy and Soil Science, University of Hawaii.

ABSTRACT

Investigations on effect of planting date, N-fertilization and plant density on the seed of soybean grown during the winter period in Hawaii showed highly significant responses to all three treatments. Seed yields from February planting were 3.6 times greater than those from January plantings, and seed yields from March plantings were 2.2 times greater than those from January plantings. Addition of N significantly increased seed yield over no N plots. Soybeans planted during the short, cool days of winter, flowered and matured earlier and were shorter in height than summer plantings.

additional index words: winter planting, plant height, pulse crops, plant populations, grain legumes

Rankine, L. B., A. B. Larson, and R. E. Green. 1966. Economic evaluation of winter vegetable production on Molokai: Molokai Demonstration Farm, results for 1964-65. Univ. of Hawaii Agr. Econ. Rep. 71. 20 p.

ABSTRACT

During the winter season 1964-65, tomatoes, cucumbers, bell peppers, zucchini squash, and dry onions were successfully grown on the Molokai Demonstration Farm.

Based on estimates of net returns on the West Coast, tomatoes and bell peppers show the highest promise as winter export crops. Cucumbers and zucchini squash were less profitable. However, the question of post-harvest handling and subsequent market acceptance is yet to be answered. Currently, studies on the effects of various methods of precooling selected vegetables are underway at the Hawaii Agricultural Experiment Station. The increase in storage life may make substantial contributions to the feasibility of exporting vegetables during the winter months. Unless some suitable methods of pre-export treatment and handling, such as fumigation and packing, are found to ensure the arrival of high-quality vegetables on the West Coast, it appears that under the present conditions these vegetables should be produced for sale in the Honolulu market.

additional index words: vegetable production, agricultural economics, crop management, marketing

Rankine, L. B., A. B. Larson, and R. E. Green. 1968. Economic evaluation of winter vegetable production on Molokai. A final report for the Molokai Demonstration Farm with an analysis of trellis systems for tomato and cucumber production. Univ. of Hawaii Agr. Econ. Rep. 80. 18 p.

ABSTRACT

Five vegetable crops--tomatoes, cucumbers, dry onions, Irish potatoes, and carrots--were produced successfully on the Molokai Demonstration Farm during the 1965-1966 winter season despite a general decline in total vegetable production throughout the state. Relatively high yields were obtained for cucumbers and dry onions, while tomato yields fell below those of previous years due to an infestation of tobacco mosaic. Although Irish potatoes and carrots were grown for the first time on the Demonstration Farm, the yields were high compared with average yields for the state during the corresponding period.

Profitable returns were estimated for tomatoes and cucumbers, assuming marketing of produce either on the West Coast or in Honolulu. Net returns were higher in Honolulu than on the West Coast. Two main factors are responsible: (1) higher wholesale prices and (2) lower marketing costs. Of the other crops, dry onions showed a profit while potatoes and carrots showed net losses.

Profitable return for sales in the Honolulu market appear possible for all the vegetables except carrots and Irish potatoes. There is not enough evidence to support profitable production of Irish potatoes and carrots on Molokai at the present time.

additional index words: agricultural economics, vegetable production, Molokai, marketing

Romanowski, R. R., J. S. Tanaka, D. L. Plucknett, and D. F. Williams. 1963. Tomato (*Lycopersicon esculentum*) herbicide screening trials in Hawaii. Hawaii Agr. Exp. Sta. Tech. Prog. Rep. 138. 25 p.

ABSTRACT

Of the chemicals cleared for use, Vegadex (CDEC) at 4 to 6 lb/acre (pounds per acre) was superior when considering crop tolerance and weed control. This herbicide can be applied as a directed preemergence spray or as a granular formulation immediately after transplanting. Furthermore, any injury incurred from spray drift should be minimal as evidenced by over-the-plant sprays. Randox (CDAA) at 4 to 6 lb/acre resulted in excellent weed control at the Waimanalo Experimental Farm; however, poor control of broadleaved weeds at other locations as well as severe crop injury from a broadcast spray and moderate injury from either a directed spray or use of granular formulation suggest limited and cautious use. Dacthal should be considered for trial use as a directed preemergence spray when it becomes available in Hawaii. The maximum clearance rate of 10.5 lb/acre may be needed to control grasses and a lower rate of 7 lb/acre should give good residual control of several broadleaved weeds.

Tillam is suggested as a preplanting treatment when nutgrass and annual grasses from seed are a problem, but the control of broadleaved weeds may require special consideration.

Aromatic oil is recommended as a postemergence (carefully) directed spray. Since Solan resulted in moderate to severe injury when sprayed over tomato plants the use of this herbicide is limited in the Islands. It may prove

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feasible as a directed postemergence spray for broadleaved weeds in that little if any crop injury results. However, the aromatic oils are less costly and provide excellent control of grass and broadleaved weeds.

All of the other chemicals tested require additional research to determine their use if any in Hawaii. The excellent weed control and slight to moderate crop injury with Treflan will receive special consideration in future experiments.

additional index words: tomatoes, herbicides

Romanowski, R. R., Jr., R. C. Barba, J. A. Crozier, Jr., and D. L. Plucknett. 1965. Banana (*Musa spp.*) and papaya (*Carica papaya*) herbicide screening trials in Hawaii. Western Weed Control Conf. Res. Prog. Rep. p. 72-73.

ABSTRACT

Bromacil and tordon were toxic to bananas, while EPTC appeared to cause slowed growth after three or four applications. Diuron plus X-77 wetting agent, gave only slight damage on light, low organic matter soils. Atrazine caused marginal leaf burn and chlorosis, while ametryne did not cause injury to banana. Weed control with ametryne and diuron plus X-77 was excellent in all three experiments. Other chemical safe for banana were: PEBC, and trifluralin-soil incorporated; prometryne; trifluralin-preemergence; aromatic oil 55AR; dalapon; diquat plus 0.5% X-77; diuron plus 0.5% X-77; and paraquat plus 0.5% X-77.

Paraquat was best for papaya on coral-rock soil when compared with diuron plus X-77 and ametryne. Diuron caused severe veinal chlorosis on older leaves while ametryne caused marginal chlorosis and burn on older leaves. Two lbs/ac of ametryne showed no leaf chlorosis and a broadcast spray of trifluralin at 4 lbs/ac gave no injury. Atrazine was the only herbicide showing injury in papaya on silty clay soils. Trifluralin gave excellent grass control, while ametryne provided good broadleaf control. Because most papaya in Hawaii is grown on (clinker-type) lava rock lands, paraquat seems most promising for this crop.

additional index words: silty clay soil, bananas, papayas, herbicides, weed control, basal sprays

Romanowski, R. R., D. L. Plucknett, and H. F. Clay, editors. 1969. Weed control basic to agriculture development. Proc. Asian-Pacific Weed Control Interchange. East-West Center, University of Hawaii. 141 p.

ABSTRACT

This book is the result of a weed control symposium held in Honolulu at the University of Hawaii in 1967. It is probably the most complete reporting of weed control in tropical areas which has been published. There are 51 papers which fall within the following major content headings: (1) general subjects, (2) new herbicides for tropics and sub-tropics, (3) rice, (4) agronomic crops, pastures and brushlands, (5) horticultural crops, (6) soil and herbicide physiology, (7) general sessions.

additional index words: weed control, herbicides, rice, crop production, pasture management

Rosenau, A. J. 1969. The residual effects of silicon, phosphorus and soil pH on yield and nutrient uptake of a ratoon sugarcane crop. M.S. Thesis, Department of Agronomy and Soil Science, University of Hawaii.

ABSTRACT

A ratoon crop of sugarcane, variety H53-263, was grown for 9 months on a Typic Gibbsihumox to study the effects of residual Si and P treatments and soil pH on cane yield and nutrient uptake. Cane yield was significantly increased by residual Si and tended to increase with residual P treatments. Soil pH appeared to have no direct effect on yield, but did influence Ca, Si, Al, K, Mg, and P which in turn affected yield. Both plant and soil Si increased significantly with increasing residual Si treatment. TCA-extractable sheath Si was more closely related to yield than was total sheath Si or soil Si. Water extractable soil Si was more closely associated with yield than was modified Truog extractable Si. Sheath Si (nine months) was water extractable soil Si were linearly related ($r=0.82$). Phosphorus uptake increased with residual Si treatment and at a particular sheath P level, increased yields were associated with increasing residual treatments. Soil and plant K levels were a function of soil Ca and yield of previous crop. Soil Al decreased with increasing pH and further decreased with increasing residual Si at constant pH. Multiple regression analysis of yield, applied factors, soil factors and plant factors resulted in a yield equation with 48 factors which accounted for 73% of the yield variation.

additional index words: Si, P, pH, sugarcane, residual effects, nutrient uptake, calcium silicate, yield equations, plant analysis, soil analysis

Rotar, P. P., T. A. Bown, and C. Lyman. 1966. Guineagrass. Univ. of Hawaii, Coop. Ext. Serv., Conserv. Leaf. 102.

ABSTRACT

A brief discussion on the use, description, companion legumes, adaptation in Hawaii, and methods of establishment and management is given.

additional index words: guineagrass, grasses, forages, tropical pastures, pasture management

Rotar, P. P., T. A. Bown, and C. Lyman. 1966. Paspalum or dalisgrass. Univ. of Hawaii, Coop. Ext. Serv., Conserv. Leaf. 105.

ABSTRACT

A brief discussion on the use, description, companion legumes, adaptation in Hawaii and methods of establishment and management is given.

additional index words: paspalum, dalisgrass, grasses, forages, tropical pastures, pasture management

Rotar, P. P., T. A. Bown, and C. Lyman. 1966. Perennial ryegrass. Univ. of Hawaii, Coop. Ext. Serv., Conserv. Leaf. 108.

ABSTRACT

A brief discussion on the use, description, companion legumes, adaptation in Hawaii, and methods of establishment and management is given.

additional index words: ryegrass, perennial ryegrass, clover, grasses, forages, pastures, pasture management

Rotar, P. P., and U. Urata. 1966. Some agronomic observations in Desmodium species: seed weights. Hawaii Agr. Exp. Sta. Tech. Prog. Rep. 147. 13 p.

ABSTRACT

Average number of seeds per pound and 1000-seed weights are presented for 189 accessions, representing 33 different species. Seed weights varied from 1.22 grams per thousand seeds (372,100 seeds per pound) for D. intortum to 8.09 grams per thousand seeds (56,100 seeds per pound) for D. canadense.

additional index words: seed size, Desmodium, pasture management, legumes

Rotar, P. P., T. A. Bown, and C. Lyman. 1967. Greenleaf desmodium or intortum. Univ. of Hawaii, Coop. Ext. Serv., Conserv. Leaf. 111.

ABSTRACT

A brief discussion on the use, description, companion grasses, adaptation in Hawaii, and methods of establishment and management is given. Special emphasis is made on the use of the proper Rhizobium inoculant for each legume.

additional index words: greenleaf desmodium, legumes, forages, tropical pastures, pasture management

Rotar, P. P., C. Lyman, and T. A. Bown. 1967. Kaimiclover. Univ. of Hawaii, Coop. Ext. Serv., Conserv. Leaf. 114.

ABSTRACT

A brief discussion on the use, description, companion grasses, adaptation in Hawaii, and methods of establishment and management is given. Special emphasis is made on the use of the proper Rhizobium inoculant for each legume.

additional index words: kaimiclover, legumes, forages, tropical pastures, pasture management

Rotar, P. P., U. Urata, and A. Bromdep. 1967. Effectiveness of nodulation on growth and nitrogen content of legumes grown on several Hawaiian soils with and without the use of proper Rhizobium strains. Hawaii Agr. Exp. Sta. Tech. Prog. Rep. 158. 11 p.

ABSTRACT

The use of the proper Rhizobium strain for each species grown in all of the different soils produced a percentage crude protein content per plant which was about 5% greater than the uninoculated (18.4% vs. 13.67%). Practical results would show that it pays to use the proper inoculum anytime a legume seeding is made.

additional index words: Rhizobium, nodulation, nitrogen content, inoculation, legumes

Rotar, P. P. 1968. Grasses of Hawaii. Univ. of Hawaii Press. Honolulu. 355 p. illus.

ABSTRACT

The text presents an up-to-date compilation and classification of all grasses introduced, or indigenous to, the Hawaiian Islands. There is a brief description of the grass plant and its taxonomy. This is followed by a listing of the tribes and genera within each tribe, and taxonomic keys to the tribes. There are taxonomic descriptions for each tribe, keys to the genera within each tribe, a description of the genera, and a listing of all the species with each genus. The final table presents a brief synopsis with the "Botanical Name", "Common Name", "Putative Origin or Native Country", and a "Date of First Record". There is an index to the scientific names.

The taxonomy is based on the Stebbins and Crampton classification into six subfamilies and has two tables comparing the Hubbard (Hutchinson, 1959), the Hitchcock and Chase, and the Bor classifications.

additional index words: grasses, Hawaii, taxonomy

Rotar, P. P. 1970. Variation in agronomic characteristics of Desmodium intortum (Mill.) Urb. and a related species. Proc. XI Int. Grassland Congr. p. 296-300.

ABSTRACT

Six open-pollinated populations from Desmodium intortum (Mill.) Urb., and a related species were studied for agronomic characteristics, including plant diameter at time of harvest per harvest period, green-weight yield per plant, leaf-to-stem ratios, percentage dry matter in leaves and stems at 2 harvest dates, and percentage nitrogen in leaves and stems at 1 harvest date. Dates of flowering during two flowering seasons are presented. Considerable variation occurred within each line and among lines for the characteristics observed. The implications for agronomic characteristics of the large gene pool available in D. intortum and a related species are discussed.

additional index words: plant variations, Desmodium agronomic characters

Saiki, D. F., D. L. Plucknett, and P. S. Motooka. 1969. A checklist of important weeds in the Asian-Pacific region. Proc. Asian-Pacific Weed Control Interchange, East-West Center, Coll. Trop. Agr., Univ. of Hawaii. p. 131-133.

ABSTRACT

A checklist of weeds from 17 countries or areas in the Asian-Pacific region is presented. Weeds are divided into three classifications according to areas of infestation: (1) wasteland, range, pasture and orchard weeds, (2) upland crop weeds, (3) lowland and aquatic weeds. Weeds are identified by scientific name only.

additional index words: Pacific islands, Asia, weed habitat, weed identification

Shigeura, G. T., J. Lee, and J. A. Silva. 1970. The role of honey bees in macadamia nut (Macadamia integrifolia Maiden and Betcher) production in Hawaii. J. Amer. Soc. Hort. Sci. 95(5):544-546.

ABSTRACT

Honey bees from commercial apiaries placed in a macadamia nut orchard increased nut yields in 2 or 3 cultivars tested. Nut set in cultivars 333 and 246 increased significantly with the presence of bees in the orchard and appeared to be dependent on the level of bee population in the orchard. Nut set in cultivar 508 was essentially unaffected by bee population level which suggests that this cultivar may be relatively self-compatible while cultivars 333 and 246 appear to be relatively self-incompatible.

additional index words: macadamia nut, honey bees, nut set

Silva, J. A. 1969. The role of research in sugar production. 1969 Reports, Hawaii Sugar Tech. p. 37-42.

ABSTRACT

Factors affecting sucrose production can be separated into uncontrollable (climatic) and controllable (management) factors. Manipulation of the controllable factors within the restrictions of the uncontrollable factors governs the level of sucrose production by a crop of sugarcane. A review of current research in the Department of Agronomy and Soil Science at the University of Hawaii included work on clay mineralogy which identified gel hulls on surfaces of clay particles and studies to develop a method for assessing the P requirement of soil. Studies on nitrogen transformations in soil, movement, adsorption and degradation of herbicides, water use by sugarcane, and mechanisms of yield response to calcium silicate applications were also reported.

additional index words: sucrose production, climatic factors, management factors, clay mineralogy, soil P requirement, water use, herbicides, calcium silicate

Takahashi, M. 1962. Report-survey of grasslands and field crops of Ryukyu islands. Mimeographed Report. 43 p.

ABSTRACT

A description of the islands and their capabilities for forage and crop production are presented along with a survey of their current productivity.

additional index words: ryukyu islands, grasslands, crop production, field crops, forage production

Takahashi, M., J. C. Moomaw, and J. C. Ripperton. 1966. Studies of napiergrass III. Grazing management. Hawaii Agr. Exp. Sta. Bull. 128. 47 p.

ABSTRACT

Three systems of grazing management were investigated at the Haleakala Branch Station, Maui at 2160 feet elevation. Systems used were: (1) grazing at immature stage of growth for a short period of time, (2) grazing at the mature stage of growth for a short period of time, and (3) grazing at the mature stage of growth, but at one-half the stocking rate so that the duration was twice as long. Studies included animal production and forage production.

It was shown that napiergrass was (1) able to yield leafy portions on a par with the silage system in a climatically marginal area, (2) that there was stability in animal and forage production through widely fluctuating climatic conditions, (3) that there were minimal losses of forage from trampling and soiling, (4) that there was freedom from preferential grazing and from weeds, and (5) that the animal production was fully equal to that of other ranking pasture grasses.

additional index words: napiergrass, pasture grasses, forage production, pasture management

Tamimi, Y. N., L. B. Sherrod, S. M. Ishizaki, and T. Izuno. 1968. The effect of levels of nitrogen, phosphorus and potassium fertilization upon beef production on kikuyugrass. Hawaii Agr. Exp. Sta. Tech. Bull. 76. 12 p.

ABSTRACT

Fertilization of kikuyugrass pastures with several rates of N, P and K had a very beneficial effect on beef production. Beef production per acre during 329 days of grazing was increased from 160 lbs. on the control paddock to 400 lbs. on the 300 lb.N/acre treatment. This was accomplished by increasing forage production which allowed higher stocking rates. Nitrogen, phosphorus and potassium fertilizers were all beneficial in increasing forage available to grazing animals. Both forage production and total crude protein production correlated highly with beef production. Increasing nitrogen fertilizer rate caused a decrease in the percentage of nitrogen in the tissue which was harvested every three months. Increasing the increments of phosphorus and potassium fertilizer was found to increase tissue phosphorus and potassium respectively. Increasing potassium fertilizer rate also caused an increase in phosphorus uptake by kikuyugrass. Under normal conditions, forage sample of a unit area for yield and protein content may be used to estimate beef that can be produced on that pasture. The following two formulas were obtained for beef production on kikuyugrass: lbs. beef produced/acre = $39.85 + .0234 \times \text{forage produces (lbs./acre ovendry)}$; lbs. beef produced/acre = $58.00 + .2624 \times \text{crude protein produced (lbs./acre)}$.

additional index words: forages, forage fertilization, beef production, pasture management

Tamimi, Y. N. 1969. Growth response of *Toona ciliata* var. *australis* to N-P-K and lime rates on a latosolic brown forest in Hawaii. Agron. Abstr. p. 126.

ABSTRACT

Australian red cedar or "toon", a member of the mahogany family, was planted on a Latosolic Brown Forest with four rates of N, (0, 112, 224, 336 kg/ha/yr); four rates of P (0, 224, 448, 672 kg/ha/yr); four rates of K (0, 112, 224, 336 kg/ha/yr) and two rates of CaCO_3 (0, 11.2 tons (metric)/ha). Trees were measured every 6 months for height and when growth allowed, d.b.h. was also measured. Chemical analyses were conducted on two leaf samplings; one when plants reached 14 months of age while the other was 28 months after planting. At three years of age the control plots (0-0-0) measured 11.4 ft. in height and 1.17 inches in d.b.h. Fertilized plots measured over 20 ft. in height and over 2.5 inches in d.b.h. The significant growth response over the control was due to fertilization with N, P and K regardless of the rate. Leaf nitrogen was significantly increased due to N level applied only when plants reached 28 months of age. Phosphorus rates failed to raise leaf percent P significantly over the control for the two growth periods investigated. As the rate of potassium applied was increased, percent K in the leaves was found to increase significantly at the 14 and 28 months age. Application of lime at 11.2 tons (metric)/ha was found to raise tissue Ca to a level that failed to reach significance.

additional index words: forestry, forest nutrition, mahogany, australian red cedar

Verhagen, A. M. W., J. J. Wilson, and E. J. Britten. 1963. Plant production in relation to foliage illumination. Annals Botany 27(108):627-640.

ABSTRACT

The intensity of light received by plants can be specified in terms of its extinction with depth in the foliage. Various light-extinction functions are introduced to specify the light received by plants with different patterns of foliage development (viz. standard exponential, best exponential, and ideal). The implications of these extinction functions are discussed and the production associated with each foliage type is studied as a function of leaf area index, LAI (the ratio of leaf area to ground area). The concepts of optimum LAI and ceiling LAI are considered in relation to these foliages. It is shown that, contrary to what has previously been thought, a foliage in which the bottom leaves are at compensation point is not necessarily at optimum LAI. It also becomes possible to reconcile conflicting views on the relationship between optimum LAI and ceiling LAI.

additional index words: environment, LAI, plant growth

Villanueva, M.R. 1971. Performance of maize (*Zea Mays* L.) at varying plant populations as influenced by genotype and field environments. M.S. Thesis, Department of Agronomy and Soil Science, University of Hawaii.

ABSTRACT

Fifteen lines of maize, including tropical and temperate varieties, were evaluated by planting in May, July, and September at the Waimanalo Experiment Station, Kauai Branch Station and Volcano Station. In addition to location and date of planting variables, plantings were made at 34,580, 44,460 and 54,340 plants per hectare. Unfavorable climatic conditions resulted in complete loss of the September planting at the Volcano.

All growth and yield characteristics examined were affected by location planting date and plant population. Highest ear and stover yields were obtained with early plantings. Late planting resulted in lower yields due to increased cloudiness, lower temperatures, excessive rainfall and high winds which caused severe lodging. Increased incidence of mosaic at lower elevations (Waimanalo and Kauai) and leaf blight at high elevation (Volcano) decreased yields of September planting.

Kauai had highest ear yields in the May planting, Waimanalo was highest in the July planting, and there was no real difference between the two locations for the September planting. Ear yields for Volcano were lowest in the July planting. In contrast to ear yields, stover yields were highest at Waimanalo, intermediate at Kauai and lowest at the Volcano for the May and July plantings. In the September planting, higher stover yields were obtained from Kauai. Stover yield of all varieties decreased as planting date was delayed from May to September.

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Plant height, ear height and ear length were reduced significantly while tasseling and silking occurred earlier as date of planting was delayed from May to July to September. With increasing population, plant and ear heights increased and ear length decreased. Tasseling and silking were delayed and the period between appearance of tassels and silks became longer as plant populations were increased.

additional index words: corn yields, dates of planting, ear yield, stover yield, varietal performance, tropical maize varieties

Warner, R. M., R. L. Fox, and S. Prasomsook. 1972. Nutrition and density studies of the Williams Hybrid Banana. Proc. 3rd Annual Hawaii Banana Industry Assoc. Univ. of Hawaii, Coop. Ext. Serv., Misc. Pub. 87, p. 30-41.

ABSTRACT

Experimental plots were established during the week of July 12, 1971. Most mats had produced their first bunch by August 25, 1972. Yields increased up to about 2.9% N in the 3rd leaf (sampled at shooting) but 95% of maximum yield was obtained at about 2.7% N. These values are considered tentative.

additional index words: banana, nitrogen fertilization, plant nitrogen, potassium fertilization, plant potassium

Whitney, A. S., and Y. Kanehiro. 1967. Two pasture legumes are heavy nitrogen-fixers. *Hawaii Farm Sci.* 16(1):7-8.

ABSTRACT

Desmodium intortum and Centrosema pubescens fixed significant amounts of nitrogen when grown in experimental plots filled with cinders. D. intortum fixed 360 lbs. of N per acre per year when grown in pure stand, and about 330 lbs. when grown with pangola or napier grasses. Centrosema fixed 240 lbs. of N in pure stand, but only half that amount when grown together with either grass. Kaimi clover (Desmodium canum) yields were low, especially when grown with pangola. However, in the kaimi-napiergrass mixture, kaimi fixed about 120 lbs. of N per acre per year.

Assuming 55% recovery of urea, the N fixed by D. intortum was equivalent to N-fertilizer inputs of about \$70 per year.

additional index words: Desmodium intortum, Desmodium canum, Centrosema pubescens, legumes, nitrogen fixation, pasture management

Whitney, A. S., and R. E. Green. 1969. Pangolagrass performance under different levels of nitrogen fertilization in Hawaii. *Agron. J.* 61:577-581.

ABSTRACT

Pangolagrass was grown on a Humic Latosol at 650 m elevation in an area of 170 cm average annual rainfall with relatively dry summers. Five levels of nitrogen from 0-640 kg ha⁻¹ yr⁻¹ were applied as (NH₄)₂SO₄ over a 2-year period. Average annual dry matter (DM) yields ranged from 3,780 kg (control) to 18,000 kg/ha, and response to succeeding increments of N ranged from 30 units of DM per unit of N for the first increment (160 kg) down to 10 units for the 480-640 kg increment. Yields were depressed when average night temperatures were ≤ 15 C and during dry periods, but yields were significantly increased by fertilization even during these periods. Percentage crude protein fluctuated with season, being highest during the cooler months. Crude protein levels were influenced only slightly by low rates of fertilization but were raised by the higher N rates to levels sufficient to insure efficient utilization by livestock. The average production of forage under clipping indicated feeding capacities ranging from 1.1 animals (360 kg steers or heifers) per ha for the control to 7.5 animals per ha for the highest N level.

Recovery of applied N increased from 36% for the first increment to 64% for the third increment, with a somewhat lower recovery for the final increment. Soil pH was reduced by 0.10-0.15 units for each ton of (NH₄)₂SO₄ applied. Liming the soil raised pH from 5.6 to 6.3 but did not influence yields of DM or crude protein. Critical levels for potash sufficiency were established at 0.11 meq/100 g of soil or 1.0% of the dry forage.

additional index words: nitrogen fertilization, potassium requirement, soil pH, crude protein levels, air temperature effects, dry period effects, latosols, pangolagrass, fertilization

Whitney, A. S., Y. Kanehiro, and G. D. Sherman. 1969. Nitrogen relationships of three tropical forage legumes in pure stands and in grass mixtures. *Agron. J.* 59:47-50.

ABSTRACT

The capacities of three tropical forage legumes to fix atmospheric N and to transfer fixed N to two associated grasses were evaluated over a 12-month period under continuously moist climate in Hawaii. Desmodium canum, Centrosema pubescens and D. intortum were grown alone and in combination with napier grass (Pennisetum purpureum) and pangola grass (Digitaria decumbens) in polyethylene-lined plots filled with fresh volcanic cinders.

The grasses averaged 4,400 lbs. DM/acre, and the legumes yielded on the average as follows: D. canum 3,530, C. pubescens 6,720, and D. intortum 16,710 lbs./acre. Forage N yields plus root N levels indicated that N fixation by D. canum averaged less than 85 lbs. N/acre, and that no transfer of N from D. canum to either grass occurred. C. pubescens fixed 240 lbs. N/acre in pure stand and about 110 lbs. N when grown with grasses. Some transfer of N from centro to the grasses was noted during a long (6-month) growing period, amounting to 6-11% of the N fixed during that period. Intortum fixed 340 lbs. N/acre in 12 months, and 5% or less of this was transferred to the associated grasses.

The nitrogen transfer observed, apparently involved N released by both the aerial and sub-aerial portions of the legume plants.

additional index words: nitrogen fixation, nitrogen transfer, Desmodium intortum, Desmodium canum, Centrosema pubescens, forage crops, legumes, pasture management

Whitney, A. S. 1970. Effects of harvesting interval, height of cut, and nitrogen fertilization on the performance of *Desmodium intortum* mixtures in Hawaii. Proc. XI Internat. Grassld. Congr. p. 633-636.

ABSTRACT

Long cutting or grazing intervals are essential for mixtures including *D. intortum* in order to assure high yields and good persistence of the legume. A 10-week interval can be employed without significant loss in quality or efficiency of utilization by cattle.

Nitrogen fertilization of the mixtures every 5 weeks was not worthwhile. However, fertilization on a seasonal basis may be useful as indicated by the response obtained to N fertilizer during seasons of poor growth.

Under the least intensive cutting regime (10-week interval, 13 cm height), dry matter and crude protein yields of the *D. intortum* mixtures were slightly less than those reported by other workers in Hawaii. The higher yields reported elsewhere are probably due to a combination of factors including location of the experiments at lower elevations fewer or less severe summer dry periods, and the use of cutting intervals longer than 10 weeks.

The contribution of *D. intortum* to the non-N-fertilized mixtures was highly significant under the 10-week cutting interval in terms of both dry matter and crude protein yield. Under lenient controlled grazing, this legume can greatly improve the productivity of pangola and kikuyu pastures in the warm humid areas of Hawaii.

additional index words: grazing management, tropical pastures, forage legumes, nitrogen fertilization, crude protein yield

Whitney, A. S. 1971. Sward characteristics of kikuyugrass: their measurement and interrelationships. Proc. Conf. on Intensive Management and Use of Forage Crops in the Humid Tropics, Guadeloupe. p. 84-92.

ABSTRACT

Kikuyugrass (*Pennisetum clandestinum* Hochst, ex Chiov.) was grown at two locations under three levels of N fertilization for three years and was studied at two-week intervals after mowing. Chlorophyll yield and leaf + stem area index (LSAI) were highly correlated with each other and with dry matter (DM) yield. Interception of blue light in the vertical plane was highly correlated with log DM yield and with LSAI. Sward height was studied for only a short period but was also closely related to DM yield. The results indicate that the forage production of kikuyugrass can be closely estimated by means of non-destructive measurements.

additional index words: tropical pastures, nitrogen fertilizers, leaf area indices

Whitney, A. S., R. E. Green, and O. R. Younge. 1973. Effects of gibberellic acid and sublethal levels of four herbicides on the cool-season regrowth of two tropical forage grasses. Agron. J. 65:473-476.

ABSTRACT

A series of experiments were conducted at two locations in Hawaii to evaluate the feasibility of increasing the cool-season growth of pasture grasses by means of chemical sprays.

In a preliminary trial from December to March, pangolagrass (*Digitaria decumbens* Stent) was treated with three levels of nitrogen (0, 56, and 112 kg/ha as $(\text{NH}_4)_2\text{SO}_4$) and then with the following chemicals: ametryne, atrazine, simazine, and dicamba, each at 560 and 2240 g/ha; and gibberellic acid (GA) at 12 and 37 g/ha. Ametryne at 2240 g/ha reduced yields at the 112-kg N/ha level only. No other significant effects were noted, but there was some indication of a small non-significant GA response.

Kikuyugrass (*Pennisetum clandestinum* Hocht, ex Chiov.) was treated at two locations during February with three levels of N (22, 56, and 168 kg/ha as $(\text{NH}_4)_2\text{SO}_4$) and then with simazine at 247 or 741 g/ha, GA at 62 g/ha, or simazine plus GA. Simazine did not affect yields except at the 168-kg/ha level of N at the 640-m elevation site; under this set of conditions, dry matter (DM) and crude protein (CP) yields were increased by 40% over the untreated control.

Much larger increases in DM and CP yields were associated with GA treatment; relative increases were highest up to 9-fold, under low N levels, especially at the 900 m elevation site (av. soil temp. @ 5 cm \leq 18°C). Absolute responses were highest, up to 2200 kg DM/ha, under high nitrogen levels and at the 640 m elevation. The GA treatment appeared to stimulate production by causing rapid increases in both photosynthetic area and stem tissue.

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The added stem tissue presumably provided additional carbohydrate "sink" capacity, thereby minimizing starch accumulation in the chloroplasts during daylight hours. Subsequent yields of GA-treated swards harvested a second time were less than controls at the 900 m elevation but greater than the controls at the 640 m elevation.

The limited response from the application of triazine compounds is in contrast to many previous reports. Our results indicate that they may be of only limited usefulness for tropical grasses, especially when the N is supplied in forms other than nitrate.

In contrast, the application of 62 g/ha of GA may be a useful adjunct to nitrogen fertilization for increasing forage production during periods of moderate temperature stress.

additional index words: pangolagrass, kikuyugrass, ametryne, atrazine, simazine, dicamba

Whitney, A. S., A. V. Ramos, and A. S. Rios. 1973. Chemical Control of paragrass (Brachiaria mutica (Forsk.) Stapf) in a humid upland area. J. Agric., University of Puerto Rico, 57:129-135a.

ABSTRACT

Several herbicides were tested on Paragrass (Brachiaria mutica (Forsk.) Stapf = Panicum purpurascens Raddi) using two or more rates, and (except for Karbutilate and Diuron) one, two, and three applications at 4 weeks apart. The chemicals were applied both to tall Paragrass and short (6 to 8 inches) regrowth at the Corozal Substation in the uplands of Puerto Rico.

Sprays applied to regrowth generally gave better control and for longer periods.

Best control was obtained with Dalapon + TCA (trichloroacetic acid) applied twice (90 percent kill after 20 weeks). The low rate (6 pounds Dalapon plus 3.4 pounds TCA acid equiv./acre initially and one-half the rate at the repeat application) was fully as effective as the higher rate tested.

Dalapon alone was nearly as effective as the Dalapon + TCA combination on both older growth and regrowth, and Asulam was highly effective when applied to regrowth. Three applications of Dalapon (6+3+3 pounds/acre) or Asulam (3+2+2 pounds/acre) on Paragrass regrowth still gave approximately 80 percent control at 20 weeks following the initial application (12 weeks after the third application).

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Amitrole and Karbutilate were less effective at the rates tested. Kerb and Diuron were ineffective.

additional index words: weed control, tropical grasses, herbicides, dalapon, TCA, Asulam, Amitrole, diuron, karbutilate

Whitney, A. S. 1974. Effects of gibberellic acid on the cool-season yields of kikuyugrass and pangolagrass. Proc. XII Internat. Grassld. Cong., Moscow (in press).

ABSTRACT

Gibberellic acid (GA₃) at rates of 50-150 g/ha was applied in Feb. to 2-week regrowth of kikuyugrass (*Pennisetum clandestinum*) and pangolagrass (*Digitaria decumbens*) previously fertilized with 135 to 180 kg N/ha. The plots were harvested four weeks later, refertilized, and harvested again six weeks later. Selected plots were treated with 50 g GA/ha during both growth periods.

Kikuyugrass responded significantly to GA at 135 kg N/ha at one site (945 m elevation, 17.8 C ave. min. soil temp. @ 5-cm depth) and at 180 kg N/ha at a second site (660 m elevation, 19.0 C). Pangolagrass at 625 m elevation responded to GA at both 135 and 180 kg N/ha. In all three experiments GA caused rapid increases in sward heights for about 14 days after application. Percent crude protein levels were lower in the treated forage, but protein yields were generally increased by GA.

GA at 50 g/ha was somewhat less effective than rates of 75-100 g/ha. Rates of 60-75 g/ha (about 1 oz./Acre) should be most economical. Two applications (one per period) of 50 g GA/ha gave better yields than one application of 100 g/ha. Growth reductions following clipping of GA-treated swards were noted. This was overcome by a second application of 50 g GA/ha. The growth reductions were due to slow, sparse initiation of regrowth from the clipped stubble. Secondary growth reductions should be minimal under gradual defoliation by grazing animals.

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Although low rates of GA can markedly improve the cool-season production of kikuyugrass and pangolagrass, the conditions under which GA responses would be economically feasible need further study.

additional index words: pasture grasses, cool season pastures, pasture management, forage growth regulators

Whitney, A. S. 1974. Growth of kikuyugrass (*Pennisetum clandestinum*) under clipping. I. Effects of nitrogen fertilization, cutting interval, and season on yields and forage characteristics. Agron. J. 66 (2): 281-287.

ABSTRACT

Kikuyugrass (*Pennisetum clandestinum* Hochst. ex Chiov.) is an important pasture forage, soil cover, and weed in many parts of the subtropics. Responses to N have been reported, but the relationships among management, climate, and forage production have not been well-defined. We therefore studied the regrowth of kikuyugrass under three N-levels (22, 56, and 168 kg/ha/yr), and three cutting intervals (2, 5, and 10 weeks) for 3 years at two locations (Kula and Makawao, Maui). The Kula site was at 945 m elevation on an Eutrandept, and the Makawao site was at 660 m elevation on a Tropohumult. Average yields ranged from 4.8 - 29.4 T/ha/yr at Kula and from 10.2 - 32.5 T/ha/yr at Makawao. Average percent N in the forage was little affected by N-rate except for an increase at the highest N-rate at Makawao.

Cutting at 2-week intervals reduced yields per unit time to 20-50% of the 10-week yields at Kula and to less than 15% of the 10-week yields at Makawao. Over a 3-year period, yields of 5-week regrowth (per unit time) were 32% of the 10-week yields at Kula but 65% of 10-week yields at Makawao. Crude protein levels in the forage under frequent cutting averaged 1.5 - 2.0 times that in 10-week regrowth. Two-week regrowth was also higher in acid-detergent solubles and lower in fiber and cellulose than 10-week regrowth. Ten-week regrowth from the high-N treatment was higher in fiber and lignin than similar forage from the low or moderate N-levels, indicating the need for careful management of N-fertilized kikuyugrass.

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Yields of 5-week regrowth fluctuated more with season than 10-week regrowth yields; ranging from 1.4 to over 100 kg DM/ha/day. Five-week regrowth yields were reduced by 11 kg/ha/day for each degree of decrease in average minimum soil temperature below 18 C ($r^2 = .93$). Above 18 C, yields increased about 16 kg/ha/day for each 100 ly/day increase in average solar radiation ($r^2 = .64$). Percent crude protein in the forage was inversely related to air or soil temperature and day length (multiple $R^2 = .57$).

Residual effects of N fertilization were greater on the Tropohumult than on the Eutrandept. After 3 years of clipping, cations were severely depleted from the upper horizons of both soils.

additional index words: soil temperature, air temperature, solar radiation, forage leafiness, forage NO₃, available soil N, base depletion

Whitney, A. S. 1974. The measurement of foliage height and its relationship to yields of two tropical forage grasses. Agron. J. 66(2):334-336.

ABSTRACT

Direct visual estimates of average foliage height based on a 28 cm x 28 cm sampling area could be made at a rate of 7.5 readings per minute using a new device which utilized a plastic fresnel lens.

Foliage height was estimated (five readings per plot) for kikuyugrass (Pennisetum clandestinum Hochst. ex Chiov.) and pangola digitgrass (Digitaria decumbens Stent) swards which varied widely in yield due to different nitrogen and gibberellic acid treatments. Average foliage height explained 94% of the variation in dry matter yields in both cases, but the regression slope was different for the two grasses. Sampling error was low in relation to experimental error. The calculated number of samples required to estimate the mean foliage height was 8-9 samples per plot for estimates ± 2 cm and four per plot for ± 3 cm ($P = 0.95$).

This approach appears especially promising for estimating forage growth rates where non-destructive sampling is desired and where swards are variable, i.e. as in grazed paddocks.

additional index words: Pennisetum clandestinum, Digitaria decumbens, forage growth estimates, pasture species, tropical pastures

Whitney, A. S. and Y. N. Tamimi. 1974. Efficiency of broadcast application of urea to subtropical pastures. Proc. XII Internat. Grassld. Cong., Moscow (in press).

ABSTRACT

Urea was compared to ammonium sulfate (AS) and ammonium-nitrate sulfate (ANS) in an experiment during three winter/spring seasons in an experiment on a Tropohumult. Dry matter yields of kikuyugrass (Pennisetum clandestinum) fertilized with urea (56-336 kg N/ha/period) were 29-90% of AS or ANS yields, depending on rate of application and year. In another kikuyugrass experiment on a Dystrandept, urea produced 59-89% as much dry matter over a 3-year period as AS at rates of 56-224 kg N/ha/yr. Urea was most effective at the 112-168 kg/ha/yr rates of N. In an adjoining experiment urea was fully as effective as AS for pangolagrass (Digitaria decumbens).

Losses of NH₃ from urea solutions applied to fresh cores from grass pastures were followed in the laboratory. Losses over a 6-day period from leafy pangolagrass and kikuyugrass cores were similar but variable (usually 18-31% of the applied N). Percentage losses were higher at 168 kg N/ha than at 84 kg/ha. Washing kikuyugrass leaves by brief sprinkling reduced NH₃ losses only slightly. Lesser amounts of NH₃ were lost from defoliated cores and bare soil. The data also suggested higher losses from kikuyugrass stubble than from pangolagrass stubble. The more open canopy and absence of thatch in pangolagrass swards may promote more frequent drying of the stubble and surface soil thereby reducing urease activity.

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Losses of NH_3 from high rate of urea applied to bare soils in the laboratory were 18% of the applied N for a Typic Eutrandept, 26% for a Typic Vitrandept, and 43% for a Hydric Dystrandept. Losses were thus greatest on the soil best suited for intensive pasture production.

additional index words: pasture fertilization, tropical pastures, nitrogen carriers

Young, H. Y., A. Chu, D. L. Plucknett, and R. R. Romanowski, Jr. 1973. Adsorption and disappearance of bromacil after application to Hawaiian soils. Proc. 4th Asian-Pacific Weed Sci. Soc. Conf. p. 257-266.

ABSTRACT

Adsorption of bromacil in three Hawaiian soils as determined by equilibration was well related to residue levels found in the field. While a decreasing adsorption gradient with depth of soil was found by laboratory test, this was not consistent in the field samples. Bromacil applied to the field disappeared rapidly as indicated by residue analysis and was essentially nondetectable in 12 months.

additional index words: adsorption isotherms, solubility, degradation

Younge, O. R., and E. T. Fukunaga. 1960. Cigar wrapper tobacco production in Kona. Hawaii Farm Sci. 9(1):4-5.

ABSTRACT

Twelve wrapper tobacco selections were grown in Kona within a range of conditions, from the dry lower edge of the coffee belt at 700 feet elevation to the moist upper regions above the coffee belt at 2300 ft. The lower areas were generally too dry and the upper areas too wet for good quality and yields. Wind was no problem. Air drying of leaf was not successful. Near-optimum locations for wrapper tobacco were in the 1000 to 1800 foot elevation range. Three crops per year can be produced. Nematode infestation was severe. Commercial evaluation of leaves showed aroma and burning quality was acceptable. Color was fair to poor and leaves were too rough and thick. Inadequate drying was blamed for poor leaf appearance.

additional index words: tobacco leaf quality, climatic zones, rainfall, drying, tobacco production

Younge, O. R., and D. H. Butchart. 1963. Irrigated sugar beet production on Maui. Hawaii Agr. Exp. Sta. Tech. Bull. 52. 36 p.

ABSTRACT

Results are presented for sugar beets grown at four sites on the Hawaiian Commercial and Sugar Co. plantation on Maui, the heartland of sugar cane production in Hawaii.

From field experiments on sugar beet production it may be tentatively concluded that beet production in Hawaii is practicable only if seedling diseases are controlled, weeds are economically controlled, the average size of the beets is brought up to about 2 pounds, and the sugar content is increased from the current 12 to 15% to at least 18% sugar. Under present conditions, it is evident that beets cannot compete with sugar cane. However, beets appear to have a high potential as an interrow crop with cane during the first 6 months of cane plant and ratoon crops, and also as a catch crop on idle land when there is a temporary surplus of irrigation water. Present indications are that sugar beets are unsuited to areas with annual rainfall in excess of 30 inches because of seedling diseases and low soil fertility.

additional index words: double cropping, diseases, quality, intercropping, catch crop, sugar beets, sugar cane, rainfall

Younge, O. R., D. L. Plucknett, and T. Izuno. 1963. Research shows that corn can make a comeback in Hawaii. Hawaii Farm Sci. 12(4):4-5.

ABSTRACT

Previous poor results with corn in Hawaii are shown to be a result of poor management and inadequate fertilization. When properly fertilized and managed, some of the infertile wetland soils can grow two, or two and a half corn crops per year, and grain yields could reach 15,000 lbs per acre per year. High phosphorus fertilization is necessary in the P-fixing soils. After initial high rates of P are applied to saturate the fixation complexes of the soils, moderate rates of N, P and K can be used to grow the crop.

additional index words: marginal lands, latosols, phosphorus fixation, phosphorus fertilization, corn, fertilization

Younge, O. R., D. L. Plucknett, and P. P. Rotar. 1964. Culture and yield performance of Desmodium intortum and D. canum in Hawaii. Hawaii Agr. Exp. Sta. Tech. Bull. 59. 22 p.

ABSTRACT

The culture of Desmodium intortum and D. canum (kaimi clover) are reported for Hawaii conditions. Six field experiments of intortum and kaimi in various mixtures with tropical grasses showed that intortum, when adequately fertilized, yields in excess of 20,000 pounds dry matter per acre per year. Controlled grazing of intortum and grass mixtures will give beef liveweight gains of 800 pounds per acre per year with only moderate fertilization.

Kaimi clover stimulates yields of associated grasses, but is a poor yielder in pure culture. Cattle weight gains over a 4-year period averaged 600 pounds per acre on four kaimi and grass mixtures under low rates of fertilization.

Both intortum and kaimi clover show marked response to P, K, Mo, and Zn on one or more common Hawaii soils. Additions of lime, Mo, and Zn give marked increases in seed. The response of wetland soils to fertilization is dramatic with both legumes. Inadequate fertilization is shown to cause poor stands and low quality yields of Desmodium.

Adequately fertilized, the intortum is shown to be fully competitive with aggressive grasses, such as kikuyu, pangola, and dallisgrass. Kaimi clover is superior in forage mixtures where little or no fertilization and/or where overgrazing is practiced.

additional index words: marginal lands, tropical pastures, liming, beef, seed production, fertilization, forage mixtures, pasture legumes

Younge, O. R., and D. L. Plucknett. 1969. Estimating the number of papaya (Carica papaya) trees required for reliable yield data. Qd. J. Agr. Animal Sci. 26:289-292.

ABSTRACT

Statistics on twice-weekly harvesting of 4, 6, and 10 papaya trees in plots of 2, 3 and 4-year-old trees, in a continuous 4-year crop cycle, showed that tree number and its interaction with treatments were nonsignificant. Harvesting of 4 trees only for yield data will save labor, and since plot size and attendant guard row trees can be correspondingly reduced, further savings in land, labor and materials can be realized.

additional index words: minimum plot size, field experiments, papaya



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