REPORT

ON

The Department of Agriculture

BARBADOS

1920—21.

ADVOCATE CO., LTD.
Printers to the Government of Barbados.

1921.

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Report has had to be much abbreviated for printing owing to the expense and delay.

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Department of Agriculture, Barbados.

FOR THE FINANCIAL YEAR 1920—1921.

STAFF.

Director of Agriculture	JOHN R. BOVELL, I.S.O., F.C.S.
Assistant Director	B. A. BOURNE, B.Sc.

EXPENDITURE.

Salaries	2,059	17	7½
Incidentals for sugar-cane, cotton and other experiments	682	7	4
Upkeep of Botanic Station	165	8	7
Fumigation of Plants	8	18	4½
Improving the breed of goats in the island		6	8
Pay and travelling expenses in connexion with sugar cane experiments	9	8	9
Purchase of apparatus, books &c....	14	2	3
Exhibition	100	9	8½
	£2,985	18	10½

RECEIPTS.

Plants in pots	91	11	10½
Canes, cotton, cassava, yams &c. grown on lands rented from Waterford Plantation	259	0	9½
Sundries:—Tamarinds sold from trees at Pavilion &c. ...	18	8	9
£	369	1	5

REPAIRS TO BUILDINGS ETC.

During the year under review minor repairs were executed to the buildings at Codrington and to the office of the Department of Agriculture at Queen's Park, Bridgetown.

DISTRIBUTION OF PLANTS, CUTTINGS, SEEDS, ETC.

The receipts for the sale of plants, etc., for the year 1920—21 amounted to £369 1. 5.

The plants and seeds distributed locally and abroad for the year are as follows:—

PLANTS.

Bougainvillaea, (Cherry red)	55 plants
" (Terracotta)	2 "
" (Purple)	96 "
Breadfruit	11 "
Casuarina	137 "
Ficus Benjamina	17 "
Fig	22 "
Grape Vine	25 "
Lemon	5 "
Lime	25 "
Mango (grafted)	156 "
Miscellaneous	174 "
Palms and ornamental plants	738 "
Pear (grafted)	7 "
Plants for Arbor Day	648 "
Rose	681 "
Shaddock	21 "
Sugar Apple	9 "

CUTTINGS, SEEDS, ETC.

Bengal Beans	3 gallons
Cane cuttings (of these 18 barrels and 1 case containing approximately 4,174 cuttings were packed in damp powdered charcoal.)	4,624
Cane seed	5 packets
Cane seedlings	3 boxes
Cotton seed	497 lb.
Eddoes (Barbados roasting)	12 "
Leguminous seed	32 packets
Mahogany seed	2 barrels
Miscellaneous	43 packets
Soursop	6 oz.
Velvet beans	1 gallon
Woolly pyrol	38½ "
Yams	427 lb.

PLANTS, ETC. IMPORTED AND DISTRIBUTED LOCALLY.

	lb.	oz.
Beet	1	12
Cabbage	1	8
Carrot	1	8
Egg Plant		3
Juno Peas	1 quart	
Kohl Rabi	10 oz.	
Leek	1 packet	
Lettuce	1 lb. 4 oz.	
Okra	1 packet	
Onion	1 lb. 8 oz.	
Parsley	2 oz.	
Spinach	1 packet	
Tomato	12 oz. 1 pkt.	
Turnip	8 oz	

EXPERIMENTS WITH SUGAR CANES.

As a separate report is issued dealing with sugar cane manurial, and other experiments, there is no need to deal further with the activities of the Department of Agriculture in connection therewith in the Annual Report.

COTTON INDUSTRY.

Experiments for improving the quality and increasing the quantity of lint from the varieties of Sea Island cotton grown in Barbados were continued during the period under review. These experiments which as has already been pointed out are carried out in two series. In the first series an effort is being made by the selection of the best formed and most vigorous plants giving heavy yields of good quality lint to improve the strain of the Sea Island cotton originally obtained from the Sea Islands but which had deteriorated. In the second series an effort is being made in a similar manner to improve the native cotton which so far seems to be practically immune to most of the insect pests and fungoid diseases of that plant. The method by which these plants are selected has so often been given in previous reports, it is unnecessary to reproduce it here.

As was mentioned in the two previous reports His Excellency the Governor has been pleased to allow Sea Island seed of a specially selected strain cotton to be grown on the lands of the Government Industrial School and the Lunatic Asylum farm, so that seed of a good strain might be available by cotton growers for planting purposes. This strain of cotton is now, owing to the fact that seed from trees attacked by the leaf blister mite is not selected, practically immune to this pest and is also to a great extent free from the usual insect and fungoid pests, with the exception of the cotton caterpillar. That a certain amount of success has attended the effort it may be mentioned that one estate in the parish of Saint Philip which grew some of the selected seed last season obtained 1,211 lb. of seed cotton per acre from a total area of 15 acres, and that another estate in the parish of Saint Michael obtained 1,085 lb. of seed cotton per acre from a total of 17 acres, thus showing that where cotton is grown intelligently under suitable conditions the results are satisfactory. In the case of estate 'A' the manager informed me that the lint and seed realized $102.54 per acre, while in the case of estate 'B' the seed and lint will, if 197 lb. of lint on hand fetches the same price as the remainder, realize $129.80 per acre. On the lands of the Government Industrial School, the Lunatic Asylum farm and the land rented from Waterford plantation from 19·82 acres there was an average yield of 795 lb. of seed cotton per acre. Five bales of lint from this cotton were shipped to Messrs. Wolstenholme & Holland, four bales of which were valued at 32d. and one bale at 25d. per lb. So far as I know, however, owing to the lessened demand for cotton just now, they have not yet been sold.

The native variety of Sea Island which has been mentioned in the recent annual reports continues to improve under the system of cultivation and selection. So far with the exception of the cotton caterpillar, this cotton seems to be free from insect pests and fungoid diseases.

LOCAL AGRICULTURAL SHOW.

This year the Local Agricultural Show for peasant proprietors, children of the elementary schools and others, was held on Wednesday, December 1, at the Pool plantation, St. John, kindly lent for the occasion by Hon. Sir Frederick J. Clarke, K.C.M.G., the Attorney. There were 395 prizes offered amounting to £50 15s. for exhibits of young oxen, milch cows, small stock, vegetables, fruit, Sea Island cotton, budded and grafted citrus and mango plants, etc. This year three prizes were offered for hats made from native grown material and the exhibitors competing were required to complete the brims of the hats in the presence of the judges, as it was stated one year that those persons who sent in hats for competition did not do the work, but that others did the work and sent them to the Exhibition in the names of those who received the prizes. This year for the first time four prizes were offered for the best Essays on the preparation of the soil, etc. and the growth of plants in tubs, pots and boxes, stating how the soil should be prepared, manured, and watered, etc. In response to these offers eight boys competed: the first prize was gained by Prince B. Walker, St. Joseph Church Boys' School; second prize by Ralph Linton, Ebenezer, St. Philip; third prize, Richard Carter, St. George's Church Boys' School; fourth prize, Oswald Harper, St. Joseph Church Boys' School. In the classes provided for the boys of the elementary schools, 111 prizes were offered for plants grown by them in half barrels, tubs, pots, or boxes and in

school gardens. Seeds of the various vegetables such as beet, carrots, cabbages, lettuce, tomatoes, etc., usually cultivated in Barbados were as customary imported and with the kind assistance of the Committee of Management distributed free of cost to peasants, small proprietors and teachers for the children of the elementary schools. The Education Board was good enough to contribute a sum of £4. 7. 10 towards the purchase of this seed. Exhibits numbering 381 were sent in from the elementary schools competing, being an increase of twenty-six over the number sent in the previous year. Of these 115 were awarded prizes to boys of the following schools, viz: Mount Hilloby Combined, thirty; St. Joseph Church Boys, nineteen; Holy Innocents Boys, eighteen; Southborough Boys, fifteen; Mount Tabor Boys, nine; Welches Combined, eight; St George Church Boys, six; St. Saviour's Boys, four; St Partricks Boys, two; and one each to St. Matthias Boys, St. Bernard's Boys, St. Augustine Boys and Greenwich Infant. As Barbados is an agricultural colony, it is felt that every effort should be made to encourage everyone to take an interest in agriculture, but especially children of the elementary schools most of whom will, in after life, be agriculturists, so again this year in addition to offering prizes to the children of the elementary schools for articles grown by them in half-barrels, tubs, pots and boxes and for articles grown in school gardens, the Committee of Management offered 32 prizes in Class VIII for various agricultural operations such as digging cane holes, forking and draining land, making yam banks and sweet potato beds, etc. Four prizes amounting in the aggregate to $4.25 were offered for collections of pinned insects which attack the economic crops in Barbados. This year for the second time prizes in Class IX were offered to girls of the elementary schools for the performance of various agricultural operations as they are able to perform such as weeding, digging Indian corn holes, making sweet potato beds and also for making baskets, etc. In this Class the Misses O'Brien again very kindly offered special prizes for articles of clothing made from flour sacks and it is a pleasure to have to record that a large number of articles were sent in. In Class X, prizes were as usual given to the head teachers of those schools that gained the greatest number of prizes for collections of plants grown in half-barrels, tubs and boxes, for the collection of articles grown in school gardens, for agricultural work performed by the children, for collections of pinned specimens of insects attacking economic crops and for the largest number of boys entered for agricultural work in Class VIII.

This year four prizes amounting to £5 16s 8d. were awarded to the following Head Teachers for the best kept school gardens, viz:—First prize, Mr. E. G. Smithwick, Hilloby Boys'; second prize, Mr. O. Walcott, St. Joseph's Church Boys'; third prize, Mr. J. R. Bayley, Southborough Boys'; fourth prize, Mr. L. T. Gay, Welches Combined. For the best collections of plants growing in half barrels, tubs, pots or boxes etc., the first prize was gained by Mr. E. G. Smithwick, Mount Hilloby, second prize by Mr. P. W. Jones, Holy Innocents, third prize by Mr. L. T. Gay, Welches Combined, fourth prize by Mr. F. A. Williams. For collections of articles grown in school gardens the first prize was awarded to Mr. E. G. Smithwick, Mount Hilloby Combined; second to Mr. O. Walcott, St. Joseph's Church Boys'; third to Mr. J. R. Bayley, Southborough Boys'; fourth prize to Mr. P. W. Jones, Holy Innocents. The winners of prizes offered for the greatest number of prizes gained for agricultural work performed by children of the elementary schools were:—first prize, Mr F. A. Williams, St George Boys' School; second prize Mr O. Walcott, St. Joseph Boys' School; third prize, Mr. L. C. Moore, St. Augustine Boys' School; fourth prize, Mr L. T. Gay, Welches Boys' Combined. This year various sums amounting in the aggregate to £18 1s. 1d. were given by the Hon. R. Haynes, M.L.C., Hon. A P. Haynes, M.L.C., Dr Briggs Clarke, M.C.P., Messrs F. A. C. Collymore, C. F. Haynes, H. A. Bovell, and Joseph Connell to be distributed to the children who took part in the competition for the prizes for the agricultural operations and for prizes to the masters of the schools who sent the greatest number of children to compete. The masters who gained the prizes were: first prize, Mr. A. O. D. Crichlow, Mount Tabor; second prize Mr L. C. Moore, St. Augustine, third prize Mr. J. T. Smith, St. Patricks, fourth prize, Mr. F. A. Williams, St. George. Diplomas of Merit of the Barbados Department of Agriculture were offered to the large cultivators for stools of sugar canes, samples of Sea Island cotton, collections of yams, sweet potatoes, eddoes, Indian corn, Guinea corn, and the best bunches of bananas and plaintains. Diplomas of Merit were also offered to the Head Teachers of the elementary schools for the best collections of plants growing in half barrels, tubs or boxes; for the best kept school gardens and for agricultural work as well as to the small proprietors for exhibits of special merit.

As Pool is situated in that part of the island where the rainfall conditions are favourable for the growth of vegetables and fruit, there was a fair number of exhibits, but still there were not as numerous as was expected from the quantity of seed distributed. The exhibits sent in from the elementary schools continued to improve, the number sent in this year being 881. In the afternoon His Excellency the Governor, Sir Charles O'Brien, K.C.M.G., visited the Show and distributed the prizes. After the distribution of the prizes the Director of Agriculture on behalf of those present said he was quite sure he was only voicing the wishes of those present when he asked them to join with him in extending to His Excellency their best thanks for being present and for having been good enough to give away the prizes. He said it was customary for him to say a few words with regard to the exhibits and he was very glad to be in a position to say that the exhibits on the present occasion were very creditable, especially those sent in by the school children which were better and more numerous than ever before. He was also very pleased to state that the ladies who were the judges of the clothing made from flour sacks which had been sent in to compete for the prizes offered by the Misses O'Brien were so struck by the excellence of the work that they recommended the award of ten additional prizes, and that the Committee of Management were good enough to sanction the extra expenditure. With regard to the exhibits sent in by the peasants he regretted to say that on this occasion some of the fruit had not been properly stem-cut or sufficiently cleaned, and were certainly a disgrace to the persons exhibiting them. He was very glad indeed to see that so much interest was taken by the masters of elementary schools in preparing their pupils to compete for the prizes offered in agriculture, and for the prizes offered for exhibits grown in school gardens, tubs, pots or boxes etc. There was no doubt about it that they could not all be Governors or Directors of Agriculture because in that case there would be no food grown for anyone. For all time it would be necessary for a certain number of people in the world to produce articles of food not only for themselves but for others. When a man wanted to be a clergyman he went where he could learn divinity ; when he wanted to be a doctor he went where he could learn something about medicine and surgery ; and so in all the various professions, and those of us who were to be agriculturists should while at school be prepared for our work in after life. He regretted to say it was very unfortunate that so very little interest was taken in the technical education of those who had perforce to follow those walks in life. He had the day before heard His Excellency mention that it was proposed to increase the vote for education in industrial walks of life. As Director of Agriculture he would express the hope that agriculture would be kept well to the fore in any allocation of funds made for the purpose of industrial training. It was only just and fair that agriculturists who formed the majority of the population should be treated with proper consideration in any such scheme. In conclusion he asked them to join with him in giving three hearty cheers for His Excellency and Lady O'Brien for having honoured the show with their presence which were most heartily accorded.

The Governor in acknowledging the vote of thanks said that this was the third occasion on which he had the pleasure of being present at the peasant shows. It was one of the days he most enjoyed during his time in Barbados. He firmly believed that the shows were of very great practical value to people of all classes in the island. He said that in spite of the long drought he considered the vegetables and fruit excellent. He was glad to see that the competition in the making of clothes from flour sacks which had been initiated by his daughters had been so successful this year that in addition to the prizes given by them, the Committee of Management of the show had awarded ten additional prizes. He was also very pleased at the good report made on the work done by the children in agriculture and he was glad to see that the numbers had increased. As regards the teaching of agricultural work he said it had his greatest sympathy but as everyone knew matters of finance were with the House of Assembly and it is for them in their wisdom to say how much money should be devoted to the various services of the colony. He was very pleased to see such a large concourse of respectable and well behaved people. He was also very glad to see his old friend Mr. Smithwick so well to the fore just as he was on former occasions. It was a splendid thing that school masters took such interest in teaching their pupils not only how to read and write but also how to earn their living. He hoped, however, that some of the other masters

would try to knock Mr. Smithwick out next year. Like himself he was not a very big man but he thought they would have a hard time. He was sure if they would try to knock him out although they may not succeed in doing so, they would achieve a larger measure of success than they had done this year. He said they were all greatly indebted to the Committee of Management for the interest they took in these shows, and to Sir Frederick J. Clarke as the attorney of the estate for having allowed the use of the factory for holding the exhibits.

Rev. J. R. Nicholls, the Inspector of Schools who has done so much in the past in assisting with these shows, said that he desired to express his thanks to the teachers for continuing to do such good work year after year. It was only Mr. Greenhalgh and himself who knew the difficulties under which they laboured in doing so, for they had to contend not only with unfavourable weather conditions but also against the ravages of the praedial thief.

Mr. Smithwick has been a sufferer at the hands of these people who preyed on the crops of others. He thought that they should recognise that the tide had turned in the big prices paid for sugar. The time had now come when they all should devote their attention to the land to make it produce more and more. If they did not, Germany would be at their heels again and she was doing it very slowly but very effectively.

REPORT OF THE ASSISTANT DIRECTOR OF AGRICULTURE ON THE ENTOMOLOGICAL AND MYCOLOGICAL WORK CARRIED OUT DURING THE SEASON UNDER REVIEW.

Before proceeding to give a summary of the work under the above heading it may be stated that the writer was on leave from December 24th 1920 until March 14th 1921. Considerable time was also spent during the remainder of the period in making a survey of the extent of the Mosaic or Yellow Mottling disease of the sugar cane, transferring to new boxes and reclassifying the entomological collections, preparing permanent microtomic sections of fungi on their host plants for the mycological herbarium and lecturing in Natural and Agricultural Science at Harrison College.

The following are the principal divisions of the work with insect pests and plant diseases for the season under review :—

(1) Plant and seed inspection and fumigation.

(2) Upkeep of collections.

(3) Investigation of insect and fungoid attacks reported or observed.

(4) Special investigations as to the extent of the Mosaic Disease of the Sugar Cane.

PLANT INSPECTION AND FUMIGATION.

The Orders made by the Governor-in-Executive Committee from time to time providing for the inspection, fumigation, disinfection and where necessary destruction of plants, seeds etc. brought into the island have been rigidly enforced during the period. In two instances, insects have been prevented from being introduced, which, as far as could be determined do not exist in the island. An interesting case of the prevention of the introduction of a serious pest of Juno peas into this island was recorded when on examination of a package of this seed imported from the United States of America, the beetle *Bruchus analis, F.* was found infesting it and subsequent to fumigation with carbon bisulphide some 340 dead beetles were recovered from the package. Three packages of plants, bulbs, seeds, etc., had to be fumigated or disinfected and in nine instances cane cuttings and other plants growing in soil from Trinidad, Demerara and other places had to be destroyed to prevent the possible introduction of the sugar-cane froghopper (*Tomaspis varia,* Fabr.) and other insect and fungoid pests of plants not known to exist in Barbados.

All cargoes of cotton seed, amounting to 33,046 bags, imported for the extraction of oil were fumigated with sulphur dioxide generated by the Clayton Disinfector mounted on the barge Hygeia. In more than one instance cargoes of seed arrived from ports which had recently become infected with either the boll weevil *Anthonomus grandis*, Boh., or the pink bollworm *Gelechia gossypiella*, Busck, but owing to strict precaution being kept, the matter was discovered in time and the seed in every instance refused admittance. Every vessel conveying cotton seed to this island is thoroughly searched and all insects collected, carefully examined before the fumigated seed is allowed to land, although this seed may be accompanied by a certificate to the effect that no dangerous insect pest is present in the country of origin. The recent introduction and spread of the pink bollworm (*Gelechia gossypiella*, Busck) in various West Indian Islands has been indeed a great source of danger to this island and every effort has been made to remove the risk of its introduction by refusing to allow seed to come in from infected regions or even from uninfected territory adjoining a region which is infected. No measures should be considered too drastic in order to keep these pests of cotton viz:—the boll weevil and pink bollworm from this island, for should they become introduced one of our most valuable and promising crops no doubt will have to be abandoned. In several instances the whole cargo of vessels conveying cotton seed to this port was found to require fumigation before anything could be allowed to land. The question arose as to whether the sulphur dioxide fumes would injure the remaining cargoes in question, and consequently experiments were conducted using cotton lint, muscovado cane sugar, corn meal, and wheat flour. In all the above instances no apparent change could be detected in the fumigated samples when compared with the controls.

A great many permanent microtomic sections of fungi were prepared for the fungus herbarium while in some instances the "celloidin method," mentioned in the Annual Report for 1919-20 was employed to preserve the fructifications of certain fungi.

The upkeep of the card catalogue of West Indian insects injurious to plants and animals with remedial measures, as well as fungi and fungicides has been attended to regularly and as information in bulletins, pamphlets, etc. became available.

INSECT ATTACKS REPORTED OR OBSERVED SUGAR CANE.

In addition to the old and well known pests of this crop, a new one was discovered during the period, not hitherto recorded for this island. This newly discovered pest belongs to the Order Hemiptera (Sub-order Homoptera) and Family Aphididae. So far it has only been found within a small area and not in great numbers, the well known ladybird *Cycloneda sanguinea* L. having been found associated with it to a large extent reducing their numbers very appreciably. The insect has been determined as *Sipha flava*, Forbes, from specimens forwarded to the Director of the Imperial Bureau of Entomology for identification. The discovery of this insect is of considerable importance on account of its highly probable relationship to the spread of the much dreaded Mosaic Disease. The species of aphis mentioned above has been proved more or less conclusively to be instrumental in the transmission of the Mosaic Disease of sugar cane and other grasses. It may be mentioned in this connection that the area in which this insect was found is on the outskirts of the area at present known to be infected with the Mosaic Disease; so that strict precautions will have to be exercised to prevent its increase or otherwise the control of the Mosaic Disease may become somewhat more difficult in that area than would be the case if this suspected "carrier" was not present.

The root-borer *Diaprepes abbreviatus* Linn., and the brown hard-back *Lachnosterna* (*Phytalus*) *smithi*, Arrow, still appear to be as prevalent and to cause as much economic loss to the sugar industry as during the last season under review. There has been as yet no co-operative action taken to reduce the prevalence of these pests, which is much to be regretted.

During the investigations with the brown hard-back *Lachnosterna* (*Phytalus*) *smithi*, Arrow, last year it was shown that the average number of eggs produced

by six beetles caught in copula in the field was 108, with a maximum of 210 and a minimum of twenty-one. Since then an adult female beetle which was reared from the egg has been experimented with. The male beetles used in the experiment for mating were also reared from the eggs. Four male beetles were introduced into the cage in order to insure a male being present throughout the life of the female. The soil in the cage was searched every few days and the number of eggs laid recorded. All beetles were fed on cassava leaves as in previous experiments with this beetle and moisture conditions were also made favourable for laying.

The results of the experiments clearly indicate that the rate of reproduction per day during the laying period is very variable even under uniform conditions. In addition to the above beetle laying 113 eggs, on dissection it showed thirty-two immature eggs of varying sizes in the abdomen thus making a total of 145 which this particular beetle was capable of producing had not death occured before the reproductive period was complete. It is noteworthy, moreover, that the average rate of reproduction per day of the above beetle was 1·4 eggs as against the mean average of 1·6 eggs from seven observations as shown in the investigations last year, showing that the results of this beetle bred to maturity under experimental conditions do not vary much from those caught in the field.

The moth borer, *Diatraea saccharalis*, Fabr., still continues to cause considerable loss in instances where healthy canes are not selected for planting and where no effort is made to control this pest by encouraging its parasites, particularly *Trichogramma minutum*, Riley.

The other pests of minor importance which were observed to cause loss were the mealy bugs *Pseudococcus calceolariae* and *P. sacchari* and the scale *Aspidiotus sacchari*. These pests did appreciable damage during the prolonged drought, sapping the juices from the cane and no doubt were responsible for much of the stunting exhibited at that time. The Chrysomelid beetle *Myochrous armatus*, Bailey, was found in some instances in cane fields during the month of September and no doubt the larvae which are usually found at the roots of cane were responsible for some loss.

The "cane fly" *Stenocranus saccharivorus* was not observed during the period and the parasite *Anagrus flavescens* evidently is holding its own against this former pest. This is indeed a fortunate circumstance relative to the Mosaic Disease, for this insect has been proved more or less conclusively to be instrumental in the transmission of this disease.

COTTON.

This crop has been free from the attack of any new pest. The leaf blister mite *Eriophyes gossypii*, Banks, was observed in a few instances but did not appear to assume proportions of much economic importance. Stem injury due to the red maggot, *Porricondyla gossypii*, Coq., was not observed on many occasions. The caterpillars of *Aletia luridula* and *Alabama argillacea* were for the most part successfully held in check by dusting with Paris green. No serious attack by aphidae has been recorded during the year.

MISCELLANEOUS CROPS, TREES, PLANTS ETC.

Indian corn (*Zea Mais*):—Considerable damage to this crop was observed in some instances to be done by the army worm *Laphygma frugiperda* S. & A. and the corn ear worm *Heliothis obsoleta*, Hubn. In few instances was any action taken to control these pests which is much to be regretted.

Tomato (*Lycopersicum esculentum*):—One peasant grower reported that his plants were diseased and would not produce fruit. Some of these plants were sent to the laboratory and on examination the roots proved to be heavily infested with the nematode *Heterodera radicicola* (Greef,) Mul. The majority of the plants in the plot in question were found to be in a dying condition. It was recommended that all the tomato plants be pulled up and burned and the plot

liberally treated with lime. For two years at least no crop of the same order or any other order affected by this disease should be grown in this infected plot.

Lime (*Citrus medica var. acida*) :—Several instances were recorded in which these trees were heavily infested with scale insects, particularly *Lepidosaphes beckii*, Newm, in conjunction with the die-back fungus disease. It was recommended that wind breaks should be established to protect these trees from the prevailing winds and conditions made favourable for active growth subsequent to a liberal pruning of diseased twigs and branches and a thorough spraying with lime sulphur. Vigorous growing trees will be found to be better able to resist the attack by the scales.

Sandbox (*Hura crepitans*).—An instance was observed in which several twigs and small branches of this tree were dead and all the leaves attached thereto. These twigs and small branches were removed and examined and several larvae characteristic of the family *Cerambycidae* were found. On further examination of the branches several adult beetles were collected which have been determined as *Leptostylus posticalis*, Gahan, by the Director of the Imperial Bureau of Entomology. Associated with the borings made by the above beetle was found a nest of the ant *Camponotus* (*Myrmosphincta*) *sexguttatus F., var. grenadensis*, For. From this collection of ants both males and females were discovered, only workers having been known previously. The twigs were also thoroughly examined and several pupae taken from the tunnels were bred to maturity and identified as *Scpturgus guadeloupensis*, Fl. & S.

It was recommended that all attacked and dry branches and twigs be removed and burned as soon as possible including all portions which may have fallen on the ground under the tree. A close watch should also be kept and any portion of twig or branch showing sign of attack should immediately be removed and burned.

Chrysanthemum sp. An amateur florist sent in a diseased specimen of this plant for examination. The main stem, lateral branches, flower stalks and buds of this plant, which was over two and a half feet tall, were green in colour and appeared quite normal while every single leaf was dark brown to black in colour and completely withered and dry. Microscopic examination of several leaves failed to reveal the presence of any specific fungoid disease, whereas nematodes were abundant in the tissues thereof. The nematodes associated with the disease was a species of *Aphelenchus* and probably *Aphelenchus olesistus*. Ritzema Bos. These nemas are said to ascend the plants and enter the tissues of the leaves through the stomata. Treating the soil with carbon bisulphide is said to destroy the nemas but not their eggs. Dusting the plants, when moist with a mixture of tobacco powder and flowers of sulphur is said to prevent the nemas from ascending the stem and entering the tissues of the leaves.

Coccidae and Aleurodidae :—Several specimens of fruit trees and garden plants were received and examined and found to be infested with the following from time to time :—*Diaspis* (*Aulacaspis*) *rosae* , Bouche, *Hemichionaspis minor* (Mask), *Lepidosaphes beckii*, Newm, *Chrysomphalus aonidum*, Linn, *Coccus viridis*, (Green), *Coccus mangiferae*, (Green), *Vinsonia stellifera*, (Westw), *Pseudococcus sacchari*, Ckll., and *P. calceolariae*, (Mask). *Aspidiotus destructor*, (Sign) was very prevalent on the leaves of the fan palm (*Thrinax sp*) but they were being held in check by the parasitic fungus *Hormodendron* sp.

Among the Hymenoptera named by Dr. Marshall at the Imperial Bureau of Entomology special mention may be made of *Tetrastichus hagenowi*, Ratz, hitherto not recorded for Barbados. In an attempt to obtain some of the well-known cockroach egg parasites *Evania appendigaster*, Linn, the writer discovered the former parasite to be present in eggs of *Periplaneta americana* collected in Bridgetown. As many as eighty-six adults have been recovered from a single cockroach egg. The parasitism by this insect appeared to be so efficient that steps were immediately taken to distribute them in the country and to various houses infested with cockroaches, and they have been reported to be doing very good work. This minute Chalcid would hardly be noticed it is so small and thus would fortunately escape destruction by the ignorant.

The small red ant mentioned in the last Annual Report as attacking eggs, larvae and pupae of *Lachnosterna* (*Phytalus*) *smithi* under experimental conditions has been determined as *Solenopsis corticalis* For.

The habits of *Agromyza sorosis*, Will, which was bred out from young leaves of *Zea Mais* attacked by a leaf-miner are very interesting and apparently have never been recorded hitherto. The damage done at present, however, is negligible.

FUNGOID ATTACKS REPORTED OR OBSERVED.

Sugar Cane.

The root disease of this crop still continues to cause very considerable economic loss to the country. On account of the extended drought the loss was particularly evident this year. The exact cause of this disease has not been ascertained definitely and considerable doubt exists among scientific workers at the present time as to whether *Marasmius sacchari*, Wakker has any parasitic relations with the root system of the suger cane. The writer has on more than one occasion isolated a species of *Rhizoctonia* from the roots of cane showing typical symptoms of root disease and is of the opinion that this latter fungus is for the most part the cause of that condition known as root disease. Until further re-earch on this most important problem is completed, planters should continue to pursue the practice of planting only healthy cuttings and pay special attention to proper tillage and drainage.

The usual fungi *Colletotrichum falcatum*, Went. and *Cephalosporium sacchari* Butl. associated with Red Rot, *Thielaviopsis paradoxa* (De Seynes J. Hohn.) causing the Pineapple Disease, *Cercospora vaginae*, Kruger, causing a red spot of the leaf sheath and *Leptosphaeria sacchari*, van Breda de Haan the cause of the Ring Spot of the leaves have been observed in various parts of the island to about the same extent as during the previous year.

Miscellaneous Crops, etc.

Cotton (*Gossypium spp.*) No specific fungoid disease caused this crop to suffer this year. The plants appeared quite vigorous although in many instances mildew and leaf-spot were present.

Sudan Grass (*Holcus sorghum sudanensis*). In an experimental plot of this grass there appeared a typical leaf disease. The leaves, particularly the older ones, were covered in reddish blotches giving them a scorched appearance. The acervuli of *Colletotrichum lineola*, Cords, were found in great abundance associated with the reddish blotches. This fungus agreed quite well with the description given by Butler, who considers it to be synonymous with *Colletotrichum graminicolum* (Ces) Wils.

Cassava (*Manihot sp.*) Several tubers were sent in from a small vegetable grower who complained that a rotting disease was doing much damage. Specimens sent in were found to be attacked by a species of *Glœosporium*. The conidia extruding from acervuli formed globular pustules. Spores in mass greyish white and having a roseate tinge, spherical, elliptic or cylindrical in shape, but mostly elliptical, hyaline, 1-2 guttulate, 4-12 x 3-4.5 microns.

The tubers in question showed signs of having been punctured and it is evident that the fungus is a wound parasite causing rot. It was recommended that all diseased portions be burned and every precaution kept to prevent the injury of healthy tubers.

Carrot (*Daucus carota.*) Some diseased specimens were forwarded for examination by a vegetable grower. The leaves of the specimens sent appeared for the most part normal green, but the tips were somewhat scorched. The root portion was quite soft externally although firmer toward the central region. On pulling diseased carrots from the ground the "skin" was often torn completely and left in the ground while the central part was removed.

Some of the soft tissue was examined microscopically and it was found to be particularly alive with a motile *Bacillus*. The organism was isolated in pure culture, and its pathogenicity demonstrated by inoculation. From the morphological and cultural characteristics of this organism it appeared to be identical with *Bacillus caratovorus*, Jones, which is known to exist in many parts of the world and which produces a soft rot of several vegetables. It was recommended that all diseased plants be carefully dug up with the soil and the whole burned. Clean methods of cultivation were strongly urged.

Mango (*Mangifera indica*). An instance was recorded in which the stems of a mango tree were heavily infested with the die-back fungus *Diplodia cacaoicola*, Hen. Both the *Macrophoma vestita*, Prill & Del and *Fusarium* stages of this fungus were found on diseased material. The fungus was isolated in pure culture and inoculation experiments tried using mango seedlings but the disease so far has not been reproduced. Thus it would appear that the fungus is only saprophytic or probably at the most a very weak parasite of the mango. It is quite possible that certain varieties may be susceptible, however, but no experiments have been conducted in this connection.

Elder (*Sambucus canadensis*) and *Gardenia* (*Tabernaemontana*). The stems of the former and young twigs and leaves of the latter which were yellowing have been found to be infested with the fungus *Diplodia cacaoicola* Hen. during the period under review.

Date palm (*Phoenix dactylifera*). An instance was recorded of a heavy infestation of this plant with the fungus *Graphiola phoenicis* (Morg) Poit. The lower leaves were very seriously damaged and in many instances completely destroyed.

Fern (*Adiantum tenerum, Sm.*) A plant was observed to have the majority of its leaves drying from their tips giving the whole plant a scorched appearance. A species of *Pestalozzia* was found associated with the diseased portions having the following description :—Spores olive green 16-19 x 4 microns, central cells dark, end cells hyaline ; apical cell with 3 filiform hyaline setae 16-14 microns long ; basal cell with a single hyaline appendage 5-8 microns long ; not constricted at the septa.

Palm (*Chrysalidocarpus lutescens*). Several young plants were observed to be suffering from leaf spot and on examination two fungi were found associated with the spots which were in the nature of irregular, purplish-brown blotches with dark margins, viz., *Leptosphaeria* sp. and *Phyllosticta* sp.

Flowering Ipomoea Vine (*Ipomoea Horsfalliae, Hort*). A complete inflorescence of the flowering vine was sent in which was reported to have dropped its flowers very suddenly and without any apparent cause. Other bunches of flowers on the same vine were similarly affected. Fructifications of the fungus *Rhizopus nigricans*, Ehr. were found on the flower stalks as well as on the remains of diseased and withered flowers. Some portions of the branched inflorescences were found to be entirely withered and dead. Fructifications were borne from apparently healthy tissue as well as withered portions. This fungus is indeed well known as a wound parasite. It was recommended that diseased inflorescences be removed at once and burned and every care taken in future to avoid wound infection.

B. A. BOURNE.
Assistant Director of Agriculture.

INFORMATION ON VARIOUS AGRICULTURAL MATTERS SUPPLIED TO THE PRESS.

Through the courtesy of the Editors of some of the local newspapers who so far have been always willing to render any assistance they can in these matters, the following subjects were brought to the notice of agriculturists :—

On May 8, giving a brief account of the cotton seed advertised that day for sale by the Barbados Co-operative Cotton Factory, Ltd. which was grown under the supervision of the Director of Agriculture, and showing why the results obtained from such seed were likely to be satisfactory.

On June 28, asking them to publish a copy of an article that appeared in the London "Observer" on June 6, relative to the loss sustained by the United States of America and Egypt from attacks of the boll weevil and the pink boll worm; and also forwarding an extract from Bulletin No. 140 of the Dept. of Commerce of the U. S. Dept. of Agriculture, showing the decrease in the U. S. Sea Island cotton crop of 1918 owing to the ravages of the boll weevil.

On October 28, notifying the public that the Mosaic or Yellow Mottling disease of the sugar cane had been discovered in Barbados, and warning planters not to take any cuttings for planting purposes from attacked canes, as the disease was spread in this manner; also inviting them if they were in doubt as to whether the canes were attacked to submit specimens to the Director of Agriculture for examination and report.

On November 18, calling attention to the Peasants Local Agricultural Show to be held at Pool, St. John on Wednesday, December 1.

On December 28, calling attention to the spread of the root borer and the brown hard-back and also to the Mosaic disease of the sugar-cane, and pointing out the necessity of carrying out those remedial measures which have been found effective in other countries, in order that maximum crops may be produced to offset the low prices for sugar that will rule for some time, owing to over production and under-consumption.

On January 14, inviting applications for plants for Arbor Day.

On February 21, informing the public that the Director of Agriculture was willing to import onion seed from Teneriffe for those persons desirous of obtaining it for planting purposes.

SUGAR AND MOLASSES CROPS.

According to the Customs Returns, the exported sugar and molasses crops of 1920 were 28,604 tons of Vacuum pan crystals, 6,133 tons of muscovado sugar and 6,712,930 wine gallons of molasses, equal at 110 gallons per puncheon, to 61,027 puncheons of molasses of all grades of the total value of £3,513,576 made up as follows:—

White Crystal sugar	147	tons	valued	at	£ 16 301
Yellow " "	431	"	"	"	27,590
Dark " "	28,026	"	"	"	1,821,716
Muscovado " "	6,133	"	"	"	343,445
	34,737				2,203 052
Fancy Molasses	5,120,575	gals.	"	"	1,066,786
Choice "	1,243,109	"	"	"	217,544
Vacuum Pan "	349,246	"	"	"	26,194
	6,712,930				3,513,576

Fancy molasses is concentrated cane juice from which most of the impurities have been removed, but owing to the impossibility in the ordinary muscovado sugar factories of concentrating each tayche or panful of fancy molasses to the same density, it is difficult to say how many gallons of this molasses are equivalent to a ton of muscovado sugar. From data obtained from various sources it would appear that 380 wine gallons of fancy molasses at 41° Baumé are equivalent to one ton (2,240 lb.) of centrifugal muscovado sugar and 115 wine gallons of choice molasses. At this rate the fancy molasses manufactured in 1920 is equivalent 18,475 tons of sugar. The total sugar crop, therefore, if no fancy molasses had been made, would have been 48,212 tons. i.e., 21,416 tons less than the previous year. The above does not include the sugar consumed in the island which may be estimated to be about 8,000 tons.

COTTON CROPS.

For the "Cotton Year" i.e., from October 1, 1919 to September 30, 1920 there were exported from 1,179 acres 206 bales of lint, weighing 100,610 lb. of the value of £13,201. There were also exported 12 bales of linters weighing 4,174 lb. of the estimated value of £97 15s. 6d. In addition, there were 247,521 lb. of seed of the estimated value of £921 all of which was, with the exception of that used for planting purposes, manufactured locally into oil and undecorticated cotton seed meal. It may be mentioned that for the previous year there were 1,445 acres of cotton which yielded 223 bales of lint weighing 114,444 lb. of the estimated value of £22,888. The yield of lint per acre for the season 1919-20 was 85 lb. as compared with 79 lb. for 1918-19.

METEOROLOGY.

The following are summaries of the observations recorded at the Government Meteorological Station for the year 1920, the details of which are given in Appendix 1.

Barometric Pressure.—During 1920 the mean pressure, corrected for temperature and gravity and reduced to sea-level, was at 9 a.m. 29·982 and at 3 p.m. 29·913 inches; the highest recorded being 30·090 inches on March 8, and the lowest 29·776 inches on October 23. In 1911 for the first time the barometric pressure was corrected for gravity. For the ten years 1910-1919 the average barometric pressure was at 9 a.m. 29·940 inches and at 3 p.m., 29·874 inches. The highest pressure at 9 a.m. during the ten years was on August 19, 1919, when it was 30·112 inches, and the lowest at 3 p.m. on April 14, 1915, when it was 29·669.

Temperature. The mean maximum temperature for the year 1920 was 85·0°F. and the mean minimum 72·5°F. The maximum extreme for the year, which was 89·3° F. was registered on October 12 and 31, and the minimum extreme which was 65·4 was registered on February 12. The mean average temperature was 78·8° F., the highest monthly range for the year was 19·4° F., the lowest was 15·5° F., and the mean monthly range 17·9° F. For the ten years 1910-1919 the average maximum temperature was 84·5° F. and the average minimum 74·3° F. The average maximum extreme during the ten years was 87·1° F., and the average minimum extreme 68·1° F.; the average mean temperature was 79·3° F, and the average range 19·9°F. During the ten years the maximum extreme was 91·1° F. on August 24, 1919, and the minimum extreme 61·0° F. on February 20, 1911.

Tension of Vapour and Relative Humidity. The mean tension of vapour for the year 1920 was at 9 a.m. ·684 and at 3 p.m ·663. For the ten years 1910-1919 the average tension of vapour was at 9 a.m ·713 and at 3 p.m ·702. The mean relative humidity for the year 1920 was at 9 a.m 65 and at 3 p.m 61. For the ten years 1910-1919 the average relative humidity was at 9 a.m. 67 and at 3 p.m. 65.

Wind. The mean daily velocity of the wind during 1920 was 13·9 miles per hour, the maximum being 28·2 miles per hour on June 23, and the minimum 3·3 miles per hour on October 16. The average velocity for the ten years ended 1919 was 11·6 miles per hour.

Rainfall. The rainfall measured at the Government Meteorological Station during 1920 amounted to 26·99 inches. This fell on 268 days, the greatest fall being 1·07 inches on November 1, and the lowest ·01 of an inch on February 10, March 30, May 27, June 10, July 1, November 10, and 26 For the ten years 1910-1919 the average rainfall was 47·12 inches and the average number of days on which rain fell was 178.

Rainfall of the Island. The total mean rainfall for the year 1920 from 117 stations was 42·09 inches which fell on 146 days and was 19·99 inches below the average for the sixty years ended December 31, 1919 which was 62·08 inches. The details with respect to the number of days on which rain fell at each of the stations during each month of the year, the total rainfall for each month, and in a number of instances, the height of the rain gauge above sea-level are given in Appendix II.

NOTE.—Owing to the reasons given in the note at the beginning of the report Appendices I and II have been omitted.