*J. Pharm. Pharmacol.*, 1965, **17**, 98–107 Received September 30, 1964

# Pharmacological properties of some West Indian medicinal plants

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Aqueous extracts of 47 West Indian medicinal plants have been tested for their pharmacological activity. Most of the extracts had slight activity only. Some extracts had more pronounced pharmacological properties and are discussed in greater detail.

A COMPREHENSIVE study of West Indian medicinal plants was undertaken to determine whether these plants contain substances of therapeutic or toxicological importance. Many are still used by certain groups of West Indians. The plants are usually ingested as beverages ("bush teas") prepared by steeping either the leaves or the whole plant in hot water and their prolonged use may play a part in the aetiology of some diseases which are relatively common in the West Indies, such as veno-occlusive disease of the liver (Bras, Berry & György, 1957).

The present study was done in collaboration with the University of the West Indies. The review of 250 Jamaican medicinal plants by Asprey & Thornton (1953, 1954, 1955) was used as a guide in the selection of plants to be tested. A report on the pharmacological properties of 55 plants has already been published by Feng, Haynes, Magnus, Plimmer & Sherratt (1962). The results of the pharmacological testing of a further 47 plants are herein described. Thirty-two of these plants have previously been examined by Feng, Haynes, Magnus & Plimmer (1964), using a different screening programme.

## Methods

### PREPARATION OF PLANT EXTRACTS

The plants were identified by the Botany Department of the University of the West Indies and the aqueous extracts prepared by the Chemistry Department of that University, using the method of Feng & others (1962). Usually the aqueous extract from which high molecular weight material had been precipitated with ethanol was used in the pharmacological tests. However, the crude aqueous extracts of a few plants were used before precipitation with ethanol and these plants are marked with an asterisk in the tables of results. One ml of the final aqueous extract was equivalent to 1 g of fresh plant tissue. When necessary extracts were neutralised before testing.

### PHARMACOLOGICAL TESTING

The following pharmacological tests were made.

*Acute toxicity. Intraperitoneal injection.* The plant extracts were injected intraperitoneally (i.p.) into albino mice weighing 20–30 g; 5 mice

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were used at each dose level. Initially the dose was usually 10 ml/kg. Depending on the effects observed further doses in a logarithmic series ranging from 2·5–20 ml/kg were injected into other groups of mice. The animals were observed for at least 15 min after injection and a record was made of the effect of the extract on general behaviour, respiration, reflexes (pinna, corneal and righting), grip, performance on an inclined plane at 45° and on a rotating rod. Surviving animals were examined at 24 hr intervals for one week and any deaths were recorded.

*Intravenous injection.* Extracts were only injected intravenously (i.v.) if they had a pronounced effect on intraperitoneal injection. Injections were made into the lateral tail vein of groups of 5 albino mice (20–30 g) and the same observations made as for the intraperitoneal injections. The initial dose was usually 5 ml/kg but lower doses were injected if this dose killed all the mice in the group.

*Effect on isolated organ preparations. Guinea-pig ileum.* A portion of terminal ileum (3–4 cm long) was set up in a 15 ml bath of oxygenated Tyrode solution at 37°. The extract (0·007–0·013 ml/ml bath fluid) was added to the bath and left in contact with the ileum for 25 sec. If the extract possessed marked spasmogenic properties an attempt was made to determine the site of action of the active principle by adding antagonists to known spasmogens to the Tyrode solution. The antagonists used were atropine sulphate (0·005 $\mu$g/ml bath fluid), mepyramine maleate (0·1 $\mu$g/ml bath fluid) and 2-bromolysergic acid diethylamide (BOL; 13 $\mu$g/ml bath fluid). These doses were sufficient to block the submaximal responses of the ileum to acetylcholine, histamine and 5-hydroxytryptamine (5-HT) respectively. Submaximal contractions of the ileum were obtained by the consecutive addition of 2 known spasmogens and the extract to the bath. The antagonist to one of the known spasmogens was then added to the Tyrode solution and the 3 spasmogens tested in the same order as before.

All the plant extracts were also tested for their effect on submaximal contractions of the ileum induced by acetylcholine, histamine and barium chloride. Depending on the sensitivity of the preparation, the doses used of these spasmogens were approximately 0·007–0·02 $\mu$g/ml bath fluid of acetylcholine and histamine and 70 $\mu$g/ml bath fluid of barium chloride. The dose of extract was 0·007–0·013 ml/ml bath fluid.

*Rabbit duodenum.* A portion of duodenum (approximately 4 cm long) was set up in a 50 ml bath of Tyrode solution at 37°, through which passed a constant stream of 95% oxygen, 5% carbon dioxide. Up to 0·017 ml extract per ml bath fluid was added to observe the effect of the extract on the pendular movement and muscle tone of the duodenum.

*Rat phrenic nerve-diaphragm.* The preparation was set up in a 100 ml bath of oxygenated Tyrode solution at 37° as described by Bulbring (1946). The effect of the extract on the response to nerve stimulation was observed. The dose of extract was 0·001–0·005 ml/ml bath fluid.

*Rabbit heart.* The Langendorff preparation of the rabbit isolated heart was perfused with oxygenated Ringer's solution at 35°. The effect

of the extract on the amplitude of contraction was noted after adding up to 0·2 ml of the extract to the perfusing fluid.

*Effect on cat blood pressure.* Some of the extracts that had an effect on the rabbit isolated heart were tested for their effect on the cat blood pressure. Cats (2–3 kg) were anaesthetised with chloralose (80 mg/kg intraperitoneally). The blood pressure was recorded from the common carotid artery. Heparin (1,000 units/kg) was given intravenously. The extracts (0·1 ml/kg) were injected into the femoral vein.

*Effect on the barbiturate sleeping time of mice.* Only those plant extracts were tested that caused convulsions, excitement or sedation on intravenous injection into mice. Hexobarbitone sodium (100–125 mg/kg) was injected intraperitoneally into groups of 6 albino mice. This produced a sleeping time of 10–20 min in the control group, the members of which also received an intraperitoneal injection of 0·9% saline (10 ml/kg). The experimental group was injected intraperitoneally with up to 10 ml/kg of extract; the dose of extract used was always below the minimal lethal dose. The sleeping time was regarded as the period between the loss and regaining of the righting reflex.

The significance of the results was assessed by Student's *t*-test.

## Results and discussion

The results are described in Tables 1–5. None of the plant extracts had any effect on the rat phrenic nerve-diaphragm preparation and the results of this test have therefore not been tabulated.

The extracts tested had a number of different pharmacological activities which frequently could not be related either to known constituents of the plants or to their medicinal uses in the West Indies and elsewhere. However, it is possible to draw certain conclusions from the results obtained.

Some plants, e.g., *Mangifera indica*, *Cordia brownei*, *Poinciana regia* and *Desmodium axillare*, caused depression, frequently accompanied by writhing and ataxia, on intraperitoneal injection but had little or no effect on intravenous injection. This reaction was probably due to pain and with *M. indica* might have been due to the tannins known to be present in the leaves of this plant, which are used in Africa and the East for their astringent properties (Asprey & Thornton, 1953). In most instances, however, the active principles are unknown.

A few plant extracts were found to contain substances with either acetylcholine or histamine-like activities. Thus *Triumfetta hispida* and *Cissus sicyoides* were found to contain acetylcholine or a related compound, and histamine was identified pharmacologically in extracts of *Ervatamia divaricata*, *Opuntia tuna*, *Pedilanthus jamaicensis* and *Sida rhombifolia*. The presence of these substances in "bush teas" would not be of any medicinal value, since they are both rapidly inactivated in the gastrointestinal tract.

Various *Cassia* species are widely used as purgatives and anthelmintics. Senna is the name given to the dried leaves or pods of *C. acutifolia* Delile

TABLE 1. ACUTE TOXICITY TESTS ON MICE

| Plant | | Route of admin. | Dose ml/kg | Effects on groups of 5 mice |
|---|---|---|---|---|
| Family | Botanical name | | | |
| Apocynaceae .. | *Ervatamia divaricata* (L.) Burkh. | i.p. | 10–20 | Depression and slight tachypnoea. Mice normal after 24 hr |
| | | i.v. | 5 | Transient excitation and tachypnoea |
| Asclepiadaceae .. | *Calotropis procera* R.Br. | i.p. | 10 | Depression. After 24 hr 4 mice normal; 1 mouse depressed; dead after 72 hr |
| | | i.v. | 5 | Depression and hypopnoea. Mice normal after 24 hr |
| Bignoniaceae .. | *Catalpa longissima* Dum.-Cours. | i.p. | 10 | Slight depression, ataxia and writhing. 2 mice dead after 72 hr. Remainder normal after 1 week |
| | | i.v. | 5 | Depression and hypopnoea. Mice normal after 24 hr |
| | *Crescentia cujete* L. | i.p. | 20 | No immediate effect, but 2 mice dead after 48 hr. Remainder normal after 1 week |
| Boraginaceae .. | **Heliotropium angiospermum* Murray | i.p. | 10–20 | Depression and slight tachypnoea. Mice normal after 24 hr |
| | | i.v. | 5 | Transient slight tremor and apparent increase in aggressiveness |
| Caesalpiniaceae .. | *Cassia emarginata* L. | i.p. | 2·5 | Depression, ataxia and hyperpnoea. Mice became more sensitive to sound; clonic convulsions within 15 min. 3 died; remainder normal after 24 hr |
| | | i.v. | 0·5 | Depression, ataxia and hyperpnoea. Mice showed tremor; 2 had clonic convulsions. 1 died; remainder normal after 24 hr |
| | *Cassia fistula* L. | i.p. | 10–20 | Depression, ataxia and hypopnoea. Mice normal after 24 hr |
| | | i.v. | 5 | Depression and hypopnoea. Mice normal after 24 hr |
| | **Poinciana regia* Boj. | i.p. | 10 | Severe depression, writhing and hypopnoea. Mice normal after 24 hr |
| | | i.v. | 5 | No immediate effect. After 24 hr 1 mouse dead; remainder depressed and ataxic but normal after 48 hr |
| Combretaceae .. | *Terminalia catappa* L. | i.p. | 5 | Depression, slight ataxia and hypopnoea. After 24 hr mice depressed and constipated; 5 dead after 72 hr |
| | | i.v. | 5 | Depression, ataxia and hypopnoea. After 24 hr 4 mice normal; 1 dead |
| Compositae .. | *Tithonia diversifolia* Gray | i.p. | 10–20 | Depression, ataxia and hyperpnoea. Mice normal after 24 hr |
| | | i.v. | 5 | No apparent effect on 4 mice; 1 had clonic convulsions, but recovered rapidly |
| Cucurbitaceae .. | *Cucumis anguria* L. | i.p. | 20 | Depression, twitching and hypopnoea. After 24 hr 1 mouse dead; remainder severely depressed; dead after 48 hr |
| | | i.v. | 5 | Slight twitching and tachypnoea. Mice normal after 24 hr |
| Iridaceae .. | *Aristea compressa* Buch. | i.p. | 10 | Depression and hypopnoea. After 24 hr 4 mice dead; survivor severely depressed; dead after 48 hr |
| | | i.v. | 5 | Slight excitation and apparent increase in aggressiveness. After 24 hr 3 mice depressed; 3 dead after 48 hr. Remainder normal after 1 week |

* Crude aqueous extracts.

TABLE 1—*continued*

| Plant | | Route of admin. | Dose ml/kg | Effects on groups of 5 mice |
|---|---|---|---|---|
| Family | Botanical name | | | |
| Meliaceae .. | *Trichilia hirta* L. | i.p. | 10 | Depression and transient writhing. Mice normal after 24 hr |
| | | i.v. | 5 | 2 mice had clonic convulsions. 1 died. Remainder normal after 24 hr |
| Mimosaceae .. | *Acacia lutea* Hitch. | i.p. | 10 | Depression and slight dyspnoea. After 24 hr 1 mouse dead; 4 apparently normal. After 48 hr 3 mice dead; survivor normal after 1 week |
| | | i.v. | 5 | Depression and hypopnoea. After 24 hr 1 mouse dead; remainder normal |
| Nyctaginaceae .. | *Mirabilis jalapa* L. | i.p. | 5 | Depression, tachypnoea and reduced grip. The cornea was opaque and corneal and pinna reflexes were reduced. After 24 hr 1 mouse dead; 2 normal and 2 depressed. After 48 hr 2 mice dead; remainder normal after 1 week |
| Polygonaceae .. | *Polygonum chinense* L. | i.p. | 10 | Depression and ataxia. Mice normal after 24 hr |
| | | i.v. | 5 | Depression, ataxia, hyperpnoea and slight head tremor. After 24 hr 1 mouse dead; remainder normal |
| Solanaceae .. | *Capsicum frutescens* L. | i.p. | 10 | Depression and slight ataxia. Mice normal after 24 hr |
| | | i.v. | 2·5 | Depression, dyspnoea and clonic convulsions. 1 mouse died after convulsions; remainder normal after 24 hr |
| | *Solanum verbascifolium* L. | i.p. | 10 | Depression, ataxia and tachypnoea. 5 mice dead after 2 hr |
| | | i.v. | 2·5 | Depression, ataxia and hyperpnoea. 2 mice had clonic convulsions and died. Remainder normal after 24 hr |
| Verbenaceae .. | **Lantana camara* L. | i.p. | 10 | Depression and tachypnoea. After 24 hr mice slightly depressed. After 48 hr 2 mice dead; remainder normal |
| | | i.v. | 5 | Depression, hypopnoea, fine head tremor and twitching. Mice normal after 24 hr |
| Vitaceae .. .. | *Cissus sicyoides* L. | i.p. | 10 | Depression. Mice normal after 24 hr |
| | | i.v. | 5 | Slight excitation. Mice normal after 24 hr |
| Zygophyllaceae .. | **Kallstroemia maxima* Torr. et Gr. | i.p. | 10 | Depression, ataxia and tachypnoea. After 24 hr 4 mice dead; survivor severely depressed, dying after 48 hr |
| | | i.v. | 5 | Depression. After 24 hr 1 mouse dead; remainder depressed; normal after 48 hr |

The following extracts had no effect in a dose of 20 ml/kg i.p.

Annonaceae *Annona squamosa* L. Asclepiadaceae *Asclepias curassavica* L. Bignoniaceae *Tecomaria capensis* Fenzl. Cactaceae *Opuntia tuna* Mill. Convolvulaceae *Argyreia speciosa* Sweet. Cucurbitaceae *Luffa cylindrica* M.Roem. Phytolaccaceae *Petiveria alliacea* L.

On i.p. injection (10–20 ml/kg) the following extracts caused some of the symptoms of peritoneal irritation, e.g., tachypnoea, ataxia, writhing and depression, sometimes followed by death. However, they had no effect on i.v. injection.

Acanthaceae *Thunbergia grandiflora* Roxb. Anacardiaceae *Mangifera indica* L. var. "Black". Apocynaceae **Echites umbellata* Jacq. Balsaminaceae *Impatiens sultani* Hook. Boraginaceae *Cordia brownei* (Friesen) Johnston. Euphorbiaceae **Pedilanthus jamaicensis* Millsp. & Britton. Malvaceae **Hibiscus rosa-sinensis* L.; *Sida acuta* Burm.; *Sida rhombifolia* L. Mimosaceae *Albizia lebbeck* Benth. Moraceae *Ficus benjamina* L. Nyctaginaceae *Bougainvillea* sp. Papilionaceae *Desmodium axillare* DC. Rhamnaceae **Ziziphus mauritiana* Lam. Sapindaceae *Meliococca bijuga* L. Sapotaceae **Chrysophyllum cainito* L. Solanaceae *Cestrum diurnum* L. var. *venenatum* (Mill.)O.E.Sch. Tiliaceae *Triumfetta hispida* A.Rich. Verbenaceae *Verbena bonariensis* L.

TABLE 2. EFFECTS ON SMOOTH MUSCLE

| Botanical name | Guinea-pig ileum | | Rabbit duodenum | |
|---|---|---|---|---|
| | Dose ml/ml bath fluid | Effect | Dose ml/ml bath fluid | Effect |
| *Annona squamosa* L. . . | 0·013 | ACh, histamine and $BaCl_2$ contractions reduced by 90%, 80% and 50% respectively | 0·002 | Decrease in tone |
| *Ervatamia divaricata* (L.) Burkh. . . | 0·007 | Contraction equivalent to 85% maximal ACh contraction antagonised by mepyramine | 0·017 | None |
| *Calotropis procera* R. Br. . . . . | 0·013 | Contraction equivalent to 25% maximal ACh contraction | 0·002 | Gradual increase in tone, followed by irreversible spasm |
| *Catalpa longissima* Dum.-Cours. . . | 0·013 | ACh contraction reduced by 60% | 0·007 | Decrease in size of contractions |
| *Cordia brownei* (Friesen) Johnston | 0·013 | ACh and histamine contractions reduced by 20% and 25% respectively | 0·007 | Rapid decrease in tone |
| *Opuntia tuna* Mill. . . | 0·007 | Contraction equivalent to 75% maximal ACh contraction antagonised by mepyramine | 0·017 | Slight increase in tone |
| *Cassia emarginata* L. | 0·013 | ACh contraction reduced by 50% | 0·007 | Slight decrease in tone |
| *Cassia fistula* L. . . | 0·007 | Contraction equivalent to 70% maximal ACh contraction antagonised by BOL | 0·005 | Increase in tone |
| *Tithonia diversifolia* Grey . . . . | 0·013 | None | 0·005 | Decrease in size of contractions |
| *Cucumis anguria* L. . . | 0·013 | ACh contraction reduced by 40%; histamine contraction increased by 25% | 0·004 | Slight decrease in tone |
| *Luffa cylindrica* M. Roem. . . . . | 0·013 | ACh and histamine contractions reduced by 75% and 20% respectively | 0·017 | None |
| **Pedilanthus jamaicensis* Millsp. & Britton . . . . | 0·007 | Contraction equivalent to 55% maximal ACh contraction antagonised by mepyramine | 0·017 | None |
| *Sida rhombifolia* L. . . | 0·013 | Contraction equivalent to 90% maximal ACh contraction antagonised by mepyramine | 0·017 | None |
| *Trichilia hirta* L. . . | 0·013 | None | 0·002 | Large transient decrease in tone |
| *Acacia lutea* Hitch. . . | 0·013 | ACh contraction reduced by 20% | 0·017 | Slight increase in tone |
| *Mirabilis jalapa* L. . . | 0·013 | None | 0·002 | Sudden large decrease in tone and in size of contractions |
| *Desmodium axillare* DC. . . . . | 0·013 | ACh contraction reduced by 60% | 0·007 | Gradual increase in tone |
| *Petiveria alliacea* L. . . | 0·013 | ACh contraction reduced by 30% | 0·017 | None |

TABLE 2—*continued*

| Botanical name | Guinea-pig ileum | | Rabbit duodenum | |
|---|---|---|---|---|
| | Dose ml/ml bath fluid | Effect | Dose ml/ml bath fluid | Effect |
| *Polygonum chinense* L. | 0·013 | Contraction equivalent to 20% maximal ACh contraction | 0·004 | Slight increase in tone |
| *Capsicum frutescens* L. | 0·013 | ACh and histamine contractions reduced by 50% and 30% respectively | 0·017 | Slight decrease in tone |
| *Solanum verbascifolium* L. .. .. .. | 0·013 | Contraction equivalent to 65% maximal ACh contraction partially antagonised by both atropine and BOL. ACh, histamine and $BaCl_2$ contractions reduced by 60%, 60% and 30% respectively | 0·005 | Increase in tone, followed by spasm |
| *Triumfetta hispida* A. Rich .. .. | 0·007 | Contraction equivalent to 90% maximal ACh contraction antagonised by atropine | 0·002 | Rapid increase in tone |
| *Cissus sicyoides* L. .. | 0·013 | Contraction equivalent to 15% maximal ACh contraction antagonised by atropine. ACh contraction reduced by 40% | 0·017 | Slight decrease in tone |
| **Kallstroemia maxima* Torr. et Gr. .. | 0·013 | None | 0·006 | Slight decrease in tone, followed by an increase and prolonged spasm |

All extracts were tested on guinea-pig ileum and rabbit duodenum but only those extracts which had an effect are listed in this table.

or *C. angustifolia* Vahl and *C. fistula* is a well-known source of the purgative cassia pod and pulp. The purgative principles in this genus are anthraquinones, whose irritant properties may partly account for the depression seen in mice after intraperitoneal injection of *C. fistula* and *C. emarginata*. *C. fistula* was also found to contain 5-HT, which would explain the stimulating effect on smooth muscle and the increase in barbiturate sleeping time obtained with this extract. Some *Cassia* species are known to contain hydrocyanic acid (Watt & Breyer-Brandwijk, 1962) and this substance may be the cause of the clonic convulsions occurring after intraperitoneal and intravenous injections of an extract of *C. emarginata*. The presence of this compound in an extract of *C. emarginata* would also account for its depressant effect on rabbit isolated heart and duodenum and for the increase in the barbiturate sleeping time.

The presence of hydrocyanic acid has also been reported in *Tithonia diversifolia* (Watt & Breyer-Brandwijk, 1962). This may have been the cause of the clonic convulsions occurring in one mouse after intravenous injection of the extract, the increase in the barbiturate sleeping time and the depressant effect on rabbit isolated duodenum. No reference to the medicinal uses of this plant has been found.

Many species of *Trichilia* are used in Africa as purgatives, and the roots of some species are also used as an emetic in rheumatism, dropsy and heart disease. This genus is known to contain saponins, tannins,

TABLE 3. EFFECTS ON RABBIT ISOLATED HEART

| Botanical name | Dose ml | Effect |
|---|---|---|
| *Mangifera indica* L. var. "Black" .. | 0·05 | Transient decrease in amplitude |
| *Annona squamosa* L. .. .. .. | 0·05 | Increase in rate and amplitude, followed by recovery |
| **Echites umbellata* Jacq. .. .. | 0·1 | Large rapid increase in rate and amplitude, followed by recovery |
| *Ervatamia divaricata* (L.) Burkh. .. | 0·05 | Large increase in amplitude, followed by slow recovery |
| *Calotropis procera* R.Br. .. .. | 0·1 | Large decrease in amplitude, followed by slow partial recovery |
| *Cordia brownei* (Friesen) Johnston .. | 0·1 | Transient decrease in amplitude |
| **Heliotropium angiospermum* Murray | 0·1 | Gradual large decrease in rate and amplitude, followed by slow partial recovery |
| *Cassia emarginata* L. .. .. | 0·05 | Transient decrease in amplitude |
| *Cassia fistula* L. .. .. .. | 0·1 | Decrease in amplitude, followed by recovery |
| *Cucumis anguria* L. .. .. .. | 0·1 | Decrease in amplitude, followed by recovery |
| *Trichilia hirta* L. .. .. .. | 0·2 | Prolonged decrease in rate and amplitude |
| *Acacia lutea* Hitch. .. .. .. | 0·1 | Transient decrease in amplitude |
| *Albizia lebbeck* Benth. .. .. | 0·2 | Slow decrease in amplitude, followed eventually by asystole |
| *Bougainvillea* sp. .. .. .. | 0·05 | Transient decrease in amplitude |
| *Mirabilis jalapa* L. .. .. .. | 0·005 | Sudden large increase in rate and amplitude, followed by fairly rapid recovery |
| *Meliococca bijuga* L. .. .. .. | 0·1 | Decrease in rate and amplitude, followed by asystole |
| **Chrysophyllum cainito* L. .. .. | 0·05 | Decrease in amplitude, followed by partial recovery |
| *Capsicum frutescens* L. .. .. | 0·05 | Decrease in amplitude, followed by recovery |
| *Solanum verbascifolium* L. .. .. | 0·1 | Rapid asystole followed by gradual partial recovery |
| **Lantana camara* L. .. .. .. | 0·1 | Rapid decrease in amplitude, followed by recovery |
| **Kallstroemia maxima* Torr. et Gr. .. | 0·1 | Large prolonged decrease in amplitude |

All extracts were tested on the rabbit isolated heart, but only those extracts which had a pronounced effect are listed in this table.

TABLE 4. EFFECTS ON CAT BLOOD PRESSURE

| Botanical name | Dose ml/kg | Effect |
|---|---|---|
| *Annona squamosa* L. .. .. .. | 0·1 | Decrease of 30–40% followed by slow recovery |
| **Echites umbellata* Jacq. .. .. | 0·1 | Slight increase followed by a rapid decrease of approx. 80%; slow recovery |
| *Ervatamia divaricata* (L.) Burkh. .. | 0·1 | Transient decrease of approx. 25% |
| *Cassia emarginata* L. .. .. | 0·1 | Transient decrease of approx. 30% |
| *Terminalia catappa* L... .. .. | 0·1 | Two successive decreases of 25–30% followed by a compensatory increase; slow recovery |
| *Mirabilis jalapa* L. .. .. .. | 0·01 | Sudden increase of 75% followed by rapid recovery |
| *Capsicum frutescens* L. .. .. | 0·1 | Transient decrease of 20–25% |
| **Lantana camara* L. .. .. .. | 0·1 | Transient increase of approx. 20% |
| **Kallstroemia maxima* Torr. et Gr. .. | 0·1 | Decrease of approx. 10% followed by a slight increase before recovery |

Extacts of *Mangifera indica*, *Cordia brownei*, *Meliococca bijuga* and *Verbena bonariensis* had no effect on cat blood pressure in a dose of 0·1 ml/kg.

TABLE 5. EFFECTS ON BARBITURATE SLEEPING TIME IN MICE

| Botanical name | Dose of extract ml/kg | Effect as percentage of control (= 100) and significance |
|---|---|---|
| *Calotropis procera* R.Br. .. .. | 5 | 157, $0{\cdot}01 < P < 0{\cdot}02$ |
| *Cassia emarginata* L. .. .. .. | 1 | 156, $0{\cdot}01 < P < 0{\cdot}02$ |
| *Cassia fistula* L. .. .. .. .. | 10 | 135, $0{\cdot}02 < P < 0{\cdot}05$ |
| *Tithonia diversifolia* Gray .. .. | 10 | 185, $P < 0{\cdot}001$ |
| *Aristea compressa* Buch. .. .. | 5 | 155, $P < 0{\cdot}001$ |
| *Trichilia hirta* L. .. .. .. .. | 10 | 231, $P < 0{\cdot}001$ |
| *Polygonum chinense* L. .. .. .. | 10 | 130, $0{\cdot}02 < P < 0{\cdot}05$ |
| *Capsicum frutescens* L. .. .. .. | 10 | 160, $0{\cdot}01 < P < 0{\cdot}02$ |
| *Solanum verbascifolium* L. .. .. | 5 | 156, $P < 0{\cdot}001$ |
| **Lantana camara* L. .. .. .. | 10 | 171, $0{\cdot}001 < P < 0{\cdot}01$ |

For significance, $P < 0{\cdot}05$

Extracts of *Ervatamia divaricata*, *Catalpa longissima*, *Terminalia catappa*, *Acacia lutea*, *Cissus sicyoides* and **Kallstroemia maxima* had no effect on the barbiturate sleeping time of mice in sublethal doses.

resins, a volatile oil and fats (Watt & Breyer-Brandwijk, 1962). The depressant effect of an aqueous extract of *T. hirta* on rabbit isolated heart and duodenum might have been due to the saponin component, but the cause of the clonic convulsions occurring on intravenous injection into mice and of the considerable increase in barbiturate sleeping time is not clear from our studies.

*Mirabilis jalapa* is probably little used medicinally in Jamaica, although in India the fresh leaf juice is taken for gonorrhoea and for uterine discharges, whilst an infusion of the leaves is said to be a diuretic and is used for dropsy. The alkaloid trigonelline, which is reputed to be non-toxic, has been isolated from the plant (Watt & Breyer-Brandwijk, 1962). In the extract tested the major constituent appeared to be a catecholamine which was shown to be present by paper chromatographic analysis. Alkaloids were not detected in the extract. The catecholamine probably caused all the effects observed in the pharmacological tests.

A number of plants in the Solanaceae contain alkaloids of pharmacological importance, e.g., atropine, (—)-hyoscine (scopolamine) and nicotine. Solanine is known to be present in *Capsicum frutescens*, and this or other alkaloids could possibly account for the pharmacological effects of this extract. The fruits of this plant are used medicinally and also as condiments (chillies and Cayenne pepper). The leaves are used in Jamaica and Africa as a dressing for wounds and sores, and one leaf boiled in a little water is thought to increase urinary excretion in babies (Asprey & Thornton, 1954). No reference has been found to the medicinal uses of *Solanum verbascifolium*, although related species are commonly used in Africa in the treatment of skin diseases, pneumonia, snake bite, colic and worm infestations. Solanine has been identified in various members also of this genus. It is possible that many of the effects observed in the tests with an extract of *S. verbascifolium* were due to the

presence of nicotine, but other alkaloids and also 5-HT may have been present as well.

Only plants with pronounced pharmacological activity have been discussed. Most of these plants are used in native medicine in their countries of origin. With the possible exception of those plants that contain tannins and are used as astringents it seems improbable that they are effective in treating the diseases for which they are administered.

*Acknowledgements.* We wish to thank the Botany and Chemistry Departments of the University of the West Indies for identification of the plant material and preparation of the extracts. We are grateful to Professor A. C. Frazer, Dr. R. Schneider and Dr. H. S. A. Sherratt for their interest and advice and to Mrs. S. Spencer for technical assistance.

This investigation was supported by the Tropical Products Institute of the Department of Scientific and Industrial Research.

## References

Asprey, G. F. & Thornton, P. (1953). *West Indian med. J.*, **2**, 233–252.
Asprey, G. F. & Thornton, P. (1954). *Ibid.*, **3**, 17–41.
Asprey, G. F. & Thornton, P. (1955). *Ibid.*, **4**, 69–82; 145–168.
Bras, G., Berry, D. M. & György, P. (1957). *Lancet*, **1**, 960–962.
Bülbring, E. (1946). *Brit. J. Pharmacol.*, **1**, 38–61.
Feng, P. C., Haynes, L. J., Magnus, K. E., Plimmer, J. R. & Sherratt, H. S. A. (1962). *J. Pharm. Pharmacol.*, **14**, 556–561.
Feng, P. C., Haynes, L. J., Magnus, K. E. & Plimmer, J. R. (1964). *Ibid.*, **16**, 115–117.
Watt, J. M. & Breyer-Brandwijk, M. G. (1962). *The Medical and Poisonous Plants of Southern and Eastern Africa*, 2nd ed., Edinburgh: Livingstone.