SOME DESCRIPTION OF
EXPERIMENTAL PLANTS

Studies done on four medicinal plant of family solanaceae:

1. *Datura*, Linn

The generic name is taken from Dhattura, the Sanskrit name which Arabians adopted it as ‘tatorah’.

The genus comprises of glabrous or minutely pubescent shrub-like herbs. The leaves are large, entire and sinuate or deeply toothed. The flowers are large, solitary, pedicelled and white or purple. Calyx is long, tubular, herbaceous, 5-toothed and circumscissile above the base in fruit. Fruit is an ellipsoid, 4-celled and usually spinous capsule, which is 4-valved or irregularly burst near the apex. Seeds are many, compressed and rugose.

According to Airy Shaw (1973), 10 species occur in tropical and temperate regions of the world, chiefly in America. Only 2 species are discussed here.

*Datura metel*, Linn.


**Vernacular names:** Sans: Dhaustura, Kanak; Hind: Sadadhatura; Beng: Dhutura; Tam: Vellum-mattai; Eng: Thorn-apple
Description: It is an erect, perennial, coarse and minutely pubescent herb about 60-120 cm high. Maderata height 15 to 20 cm. Stem is woody below and purplish towards tips. Leaves are large, entire, sinuate and 7.5-15-0 cm x 5.0-10.0 cm with unequal base. The flowers are erect and whitish purple. Calyx is long tubular and 5-toothed at the apex. The corolla is long and tubular to funnel-shaped with wide mouth. Fruits are globose or ellipsoid capsules which are nodding, spinous, 1.2-2.5 cm across and 4-valved or irregularly breaking up near the apex. Seeds are compressed, rugose and brown. Seeds 3 mm in diameter, yellow and reniform.

Flowering and fruiting takes place during April-June and also during July-December.

Occurrence and distribution: It is a native of Mexico, now naturalized in India and very common in waste places, along road-sides and railway lines and in scrub jungles throughout the tropical parts of India.

Chemical constituents: The seeds contain hyosine, hyoscyamine, atropine, fastudine, fastunine, fastusic acid, daturanolene, citrostadienol, cycloeucalenol, lophenol, obtusifoliol, 4α-methylcholesterol-enol, 31-norcycloartenol, 31-norlanosterol, 31-norlanost-8-enol, 31-norlanost-9 (II)-enol, allantoin, caproic, α-and β-linolic, linoleic and oleic acids, scopolamine and factusine. The fruits contain β-sitosterol. The leaves yield norhyoscyamine, datumetine, datumelin, datumelin, l-oxo-2l, 24 S-epoxy- (20 S, 22 S)-witha-2, 5, 25-trienolide, daturilinol, withametelin, niacin, scopolamine, hyoscyamine and vitamin C. Anti-O-lectins, apohyoscine, norhyoscine, cuscohygrine,
metelodiene, noratropine, tropine, pseudotropine, 3 α-acetoxytropane, 3 α-tigloyloxytropane, 3α, 6-βdi-tigloyloxytropan-7β-01, hyoscyamine and tigloidine. Besides, apoatropine withanolide glucosides and daturametelisin A & Bare also present in the plant (cf. Chatterjee and Pakrashi, 1995).

**Parts used:** The parts used are seeds, leaves and roots.

**Medicinal uses:** According to Chopra *et al.*, (1956), the seeds, leaves and roots are used in insanity, fever with catarrh, diarrhoea, cerebral complication, skin diseases and as antiseptic. Sambamurthy and Subrahmanyan (1989), stated that an extract of the bruised leaves or seeds in oil is often very effective in allaying the pain in rheumatic swellings, boils and tumours. Besides, various plant parts are used in headache, otitis, media suppurative, sores, mumps, pain, dropsy, anasarca, madness, rheumatism, rigid thigh muscles, haemiplegia, epilepsy, convulsions, cramps, delirium, febris, pimples, small pox, venereal sores, syphilis, orchitis, (inflammations of testicles), epididymitis (inflammation of epididymis) and hydrocele (cf. Asolkar *et al.*, 1992).

The leaves are considered as anodyne, antiseptic, antispasmodic and narcotic (Chatterjee and Pakrashi, 1995) and these are smoked to cure cough. The roots are antidiarrhoeal, antipyretic and antiseptic and are used in toothache and for brushing teeth. These are boiled in milk and are administered with clarified butter to treat insanity.

The juice of the leaves is considered as a good substitute of belladona.
Folklore: In Assam, to tighten flabby breast of women, four or five leaves are heated over open fire after smearing them with mustard oil and tied over breast. This practice should be done once a day for 8-10 consecutive days (Borthakur, 1993). The paste of leaves and fruits with turmeric is applied to check inflammation of the breast. The plant is said to be used also against snake-bite. For the purpose, the juice of its leaves is used orally and part is kept on the stung portion. The seeds are pounded and their juice mixed with mustard oil and certain other ingredients is applied locally in leprosy by the people of Purulia district in West Bengal (Jain and De, 1966).

Preparation: Kanakasava, Dhaturdhum, Martyuanjaya ras, Dattuphal vasma, Dhatturadi pratep, Laghu-vis-garva taila, Dugdha vati, Jawrankush, Haba shafa and Roghan dhatura.

Raw drugs sold in market: The seeds, often mixed with that of D. stramonium are sold.

Datura stramonium, Linn.

(Syn. D. stramonium var. tarula (Linn.) Cl.)

Vernacular names: Sans: Dhattura; Hind: Dhatura; Beng: Dhatura; Tam: Ummatta; Eng : Jimson weed, Stramonium

Description: It is an erect, coarse and glabrous or farinose-puberulous annual herb about 60-120 cm high. The leaves are stalked, 15.0-17.0 cm long, ovate, deeply toothed or sinuate and pale-green. Flowers are large and purplish or violet coloured. Calyx is long, tubular and herbaceous. Corolla is long and funnel-shaped with wide mouth. The stamens are attached near the base of
tube. Ovary is bi- or spuriously four-celled. Fruits are ellipsoid, 4.0-7.0 cm long and spinous capsules. Seeds are many, compressed and rugose. Seeds 3 mm in diameter, yellow & resiform. Flowering and fruiting is during July - December.

**Occurrence and distribution:** It is found in the Himalayas from Kashmir to Sikkim upto 2743 m. and also found on Shiwalik hills.

**Chemical constituents:** The seeds contain atropine, hyoscine, eicosanoic, linoleic, lignoceric, myristic, palmitic, oleic and stearic acids, β-carbolines: 2,3,5,6-tetrahydro-9-hydroxy-1H-pyrido-[1,2,3-1m] β-carboline-3-one, 1,2,3,4,5,6,7-hexahydro-10-hydroxy-azepino- [1,2,3-I,m] β-carboline-4-one, campasterol, β-sitosterol, stigmasterol, β-amyrin, cycloartenol, cycloartenol, 24-methylenecycloartenol, citrostadienol, cycloencalenol, daturadiol, gramisterol 28-isofucosterol, lanosterol, lanost-8-en-3 β-ol, 24-methylene-lanost-8-en-3 β-01, 31-norlanosterol, 31-norlanost-8-enol, 24-methylenelanost-8-enol, 31-norlanost-9-(II)-enol, 24-methyl-31-norlanost-9 (II) -enol, lopherenol, 24-methyl- and 24-ethyl-lophenol, lupeol, chotesterol, cholest-7-enol, 24-methylenelcholesterol. 24-ethylidenecholesterol, 4 α-methylicholesterol-8-enol, 4α-, 24-dimethylcholest-7, 24-dienol, 4α-methyl-24-ethylcholest-7,24-dienol, 4α-, 14α-, 24-trimethylcholest-8, 24-dienol, obtusifoliol and lectin. The leaves contain chlorogenic acid, datugen, datugenin, daturalactone, stramonolide, withastramonolide, scopolamine, cuscohygrine, hyoscine, meteloidine, tigloidine and tropine. The flowers, stem and root contains cuscohygrine and scopolamine. Daturataturin B and Skimmianine are found in aerial parts. Besides, hyoscyamine,
hyoscine, alanine, $\gamma$-aminobutyric acid, aspartic acid, arginine, cysteic acid, glutamic acid, glycine, isoleucine, leucine, lysine, a-phenylalanine, proline, ornithine, serine, tyrosine, valine, glycosides as acetyl derivatives of caffeic, p-coumaric and ferulic acids, coumarins, kaempferol, quercetin and phytoalexinlubimin have also been reported from the plant (cf. Chatterjee and Pakrashi, 1995).

**Parts used:** The fruits seeds, flowers and leaves are used.

**Medicinal uses:** The fruits are sedative and intoxicating (Chopra et al., 1956). Their juice is applied to scalp for curing dandruff and loss of hairs. The leaves and seed are antiseptic, anodyne and narcotic (Chopra et al., 1956). The leaves are applied to sores and fish-bites and are smoked like cigarettes to give narcotic effect. The powdered leaves are made into an ointment which is used for the treatment of haemorrhoids (Agarwal, 1986). The juice of the flowers is used for earache.

**Folklore:** A paste of its fruits with turmeric is used to check inflammation of the breast. The juice of its flowers is dropped in earache. The seeds in unripe fruits are moved on plant itself and clove buds placed inside and are sealed. After 24 hours cloves, are taken out and given in asthmatic attacks in Western Maharashtra by the tribals (Upadhye et al., 1994).

**Preparation:** Kankasav, Dhaturdhum, Martyuanjaya ras and Jawarankush.

**Raw drugs sold in market:** Seeds mixed with that of *D. metal*, are sold.
**Datura metel**: The principal alkaloid of *D. metel* is scopolamine. The concentration are usually hyocimine, atropine and norhyoscamine are usually small. For the extraction of alkaloids the leaves should be gathered early in the morning when the alkaloid concentration is high. Dried leaves of *D. metel* are used in medicine for the same purposes as the leaves of baladonna and stramonium. The green leaves are reported to be used in East Africa for dyeing cloth.

The seeds of *D. metel* contain a fixed oil (c.12%) with a disagreeable odour and taste, and with the following constants: \(d^2_{80} = 0.9255\); \(n_D^{280} = 1.473\); acid val., 46.3; sapon val., 189; iod. val., 84.65; and acet val., 42.28. The component fatty acids of the oil are: solid fatty acids, 6.18; oleic acid, 60.8; \(\alpha\)-linolic acid, 23.55; \(\beta\)-linolic acid, 2.92; caproic acid, 1.0; and unsapon. matter. 2.9%. The seeds are reported to contain allantoin. The leaves contain vitamin C (222 mg/100g).


**SANs.**—Dhattura, unmatia, kanaka, shivapriya; **HINDI**, BENG., MAR. & GUJ.—Dhatura; TEL., ‘TAM., KAN. & MAL.—Ummattta.

A glabrous or farinose annual, usually 3 ft. high, but attaining in rich soils a height of 6 ft. or more. Stem erect with spreading branches; leaves pale green, ovate or triangular-ovate, 5-6 in long, irregularly toothed; flowers large, 3-8 in. long, white or violet; capsule erect, ovoid, thickly covered with sharp spines, dehiscing into 4 valves; seeds numerous, reniform. The plant is
distributed on the hills throughout India up to an altitude of 8,000 ft. and is common in north-western Himalayas. It frequents road sides and village sites, but is rarely seen in forests or on uncultivated land. Though common as a weed in many parts of the world, \textit{D. stramonium} is cultivated, particularly in U.S.A. and Europe, with a view to obtain a drug of uniform potency.

This plant prefers a rich calcareous soil. It can be grown from seeds sown in spring in drills, c. 3 ft. apart; the plants are later thinned to stand 10 ft. apart in rows. The plant is sensitive to frost and sheltered situations are, therefore, preferred for cultivation. Entire plants are cut down when the fruits are mature but green and partially dried in the sun or in the shade. The leaves are stripped and separately dried. The seeds are shaken off from the capsules when the fruits begin to burst. An outturn of 1,000-1,500 lb. of leaves and c. 700 lb. of seeds may be expected per acre.

Nitrogen manuring, which favours the growth of plants, also favours alkaloid formation. Tetra-ploids produced by colchicine treatment contain more alkaloids (sometimes double the amount), than diploids. The relative proportions of different alkaloids, however, is not affected. \textit{Stramonium} tetraploids are self-reproducing, possess larger leaves and should, therefore, have commercial prospects. The seat of synthesis of alkaloids is the root; this has been established by the study of alkaloid accumulation in reciprocal grafts of \textit{Datura} species with tobacco and tomato; scions of tobacco and tomato grafted on \textit{Datura} stocks contain stramonium alkaloids, while \textit{Datura} scions grafted on tobacco and tomato root-stocks contain no alkaloids. The alkaloids in the leaves are chiefly located in the epidermis, particularly in the upper
epidermis, and in the phloem parenchyma; the midrib contains a higher concentration of alkaloids than the petiole.

The alkaloid contents of the different parts of the plant are given in Table 1. The upper leaves and branches are richer in alkaloids than those near the base. The total alkaloid content is considerably less after a rainy period than after clear weather. Indeed, the difference is so marked, that the drug, to be rich in alkaloids, needs to be collected after a period of clear days. Leaves collected in the early morning contain more alkaloids than those picked in the evening, and leaves dried in shade contain more alkaloids than those dried in the sun. Leaves which are allowed to dry on the plant contain more alkaloids than those dried after clipping; the increase is accompanied by a decrease in the alkaloid content of root and stem, suggesting a relocation. The alkaloid content of picked leaves, exposed to a temperature of 1000 for 15 min. to destroy the enzymes as a preliminary to drying, is higher than that of leaves not so treated. The removal of flower buds increases the yield of leaves.

**STRAMONIUM** consists of dried leaves and flowering tops of D. stramonium. It has a characteristic disagreeable odour and a bitter unpleasant taste. Stramonium contains 0.3-0.5% of alkaloids, chiefly hyoscyamine \([C_{17}H_{23}O_{3}N]\); m.p., 108.5°; \([\alpha]_D=-22^0\) (50% alcohol)] and small quantities of atropine and scopolamine. Stramonium is similar to belladonna in the symptoms produced by it, and in its general physiological and therapeutic action. It is a narcotic, anti-spasmodic and anodyne, and is used chiefly to relieve the spasm of the bronchioles in asthma. It annuls the action of
acetylcholine and thus produces the effects of paralysis on the peripheral ends of the vagi in the bronchioles so that the latter relax. It is used in doses of 0.15 g., 3 times a day, increased to 1 g. daily to control salivation and muscular spasms and tremor which follow encephalitis lethargica. It is an ingredient of PULVIS STRAMONIT COMPOSITUS and other powders intended to be burnt for the relief of asthma, but the value of such powders is limited on account of the irritant fumes arising on combustion which are liable to aggravate chronic bronchitis. The leaves may be made into cigarettes or smoked in a pipe, with or without tobacco, to relieve asthma. They are also used in the treatment of parkinsonism, Stramonium is administered in pills, tablets, tinctures and extracts. Stramonium ointment, containing lanolin, yellow wax and petrolatum, is employed in the treatment of haemorrhoids.

The leaves are applied to boils, sores and fish-bites and the juice of the flowers is used for ear-ache. The juice expressed from the fruits is applied to the scalp for curing dandruff and falling hair. Stramonium is one of the chief ingredients of the Ayurvedic preparation, Kanaka Asava, used as demulcent, expectorant, anti-spasmodic and anodyne in coughs, asthma and phthisis.

The leaves of D. innoxia and D. metel are used as substitutes for stramonium and those of Xanthium stramonium Linn., Carthamus helenioides, Desf. and Chenopodium hybridum, Linn. are used as adulterants.

Stramonium may be used as a source of atropine (C_{17}H_{23}O_{3}N; m.p., 118\degree). On a commercial scale this alkaloid is
prepared by the racemisation of t-hyoscyamine with dilute alkali or by heating in chloroform solution: Atropine is optically inactive, but commercial preparations may be slightly laevorotatory due to the presence of hyoscyamine. Atropine sulphate, methobromide and methonitrate are the preparations used in medicine. Atropine is a stimulant for the central nervous system, acting especially on the motor area affecting co-ordinate movements and causing in large doses, restlessness, talkativeness and delirium. It prevents also the effects of acetylcholine at the terminations of parasympathetic nerves which supply glands, plain muscles and the heart. When given orally or parenterally, it diminishes certain body secretions. It is of considerable value for relaxing spasmodic contractions of involuntary muscles and is used for this purpose in renal and biliary colic and in asthma. In ophthalmology, atropine, in the form of sulphate, is extensively used for dilating the pupil and increasing intraocular pressure.

Hyoscyamine is intermediate in its central action between atropine and hyoscine. It causes less stimulation of the central nervous system than atropine and is a weaker sedative and hypnotic than hyoscine but is more powerful than atropine in its peripheral action. It is used to relieve tremor, rigidity and excessive salivation in paralysis agitans. It is less reliable as a rapid sedative than hyoscine hydrobromide.

In view of the plentiful supplies of D. stramonium and D. metel available in India, it is surprising that most of the stramonium preparations and the alkaloids, hyosciamine atropine and scopolamine, are imported from outside. Small Quantities of
gelenicals and tinctures are being produced in India and a firm in Calcutta is reported to be producing scopolamine hydrobromide.

In addition to the alkaloids, the leaves, stems, flowers and teguments of the owles of \textit{D. stramonium} contain chlorogenic acid. A dark coloured essential oil (0.045\%) has been obtained from the leaves. From the plants grown in China, 2- neutral principles, datugen (C_{13}H_{20}O_{2}; m.p., 295^{\circ}) and datugenin (C_{16}H_{22}O_{5}; m.p., 265^{\circ}) have been isolated.

The seeds of \textit{D. stramonium} have a more powerful effect than the leaves, but due to the presence of a large amount (16-17\%) of fixed oil, it is difficult to obtain stable preparations from them. They have been employed for suicidal and homicidal purposes. The victim suffers from dryness of the throat, giddiness, hallucination and staggering; the voice is unrecognisable and the vision is affected; the patient lapses into coma which may end in death.

The seeds contain a fatty oil. The following constants have been recorded for the oil (yield, 16.3\%) extracted from seeds collected in Banga-lore: sp. gr.^{250} 0.9184; n^{250} 1.4735; acid val., 5.6; acet. val., 25.6; sap. val., 187.1; iod. val. (Hanus), 122:6; R.M. val., 0.44; total fatty acids, 87.7\% (solid acids, 13.1\%); and unsapon. matter, 2.6\%. The component fatty acids of the oil include: oleic, linoleic, palmitic, stearic and lignoceric acids. The unsaponifiable matter contains sitosterol.

**SOLANUM:**

\textit{SOLANUM}, Linn. (\textit{Solanaceae}): A large genus of herbs shrubs and rarely trees found throughout the temperate and tropical parts
of the world. Over 50 species have been recorded in India and a few ornamental exotics have been introduced into the gardens.

The genus is economically very important as several species are sources of food fodder and drugs. Some varieties are grown in gardens for ornament. The common potato is not only a prime food but also a source of starch, flour, dextrin, syrup, several alcohols, fodder (especially for hogs) and a host of other minor industrial products. Fruits of the eggplant or brinjals are consumed as a summer vegetable all over India. Leaves of Black Nightshade (*S. nigrull* Linn.) have long been used in medicine for treatment of scrofulous dyscrasias.

Several species of *Solanum* produce glycoalkaloids which on hydrolysis and removal of sliar residues yield steroidal alkaloids with 27 carbon atoms. Solanine (now resolved into six glycoalkaloids with common aglycone), and solasonine are widely distributed among the members of the genus. The aglycones of these two glyco-alkaloids are respectively solanidine (*C*₂₁*H*₄₃*NO*) and solasodine (*C*₂₇*H*₄₃*NO*₂). The latter occurs as the aglycone of sola margine and solanigrine (α- and β-solanigrine). The solanum glycoalkaloids are toxic to animals when injected. Like the saponins they are surface-active and haemolytic and possess antifungal and cytostatic properties. Solanum alkaloids have close structural and configurational relationships with steroidal sapogenins and many interconversions between alkaloids and steroids and steroidal sapogenins have been accomplished. The more important glycoalkaloids of *Solanum* spp., together with their aglycones and sugar components, are listed in Table 1.
**S. nigrum, Linn. BLACK NIGHTSHADE**

SANS.—Kakallachi; HINDI—Makoi; BENG.—Gurkamai, kakmachi, tulidun; GUJ.—Piludi; TEL.—Kachchi-pundu, kaehi, kamallchi, gajju chettu; TAM.—Munatakali.

PUNJAB—Mako, kambe, kachmach, riaungi (the fruit);
ASSAM—Pichkati; BOMBAY—Kamuni, ghati mako.

A herbaceous or suffrutescent weed, 30-45 cm. high, found throughout India in dry parts, up to an elevation of 2,100 m. Leaves ovate or oblong, sinuate-toothed or lobed, narrowed at both ends; flowers white, in drooping umbel-like 3-8-flowered clusters; berries red, yellow or black, round; seeds discoid, smooth, yellow, minutely pitted.

There are three different forms of *S. nigrum*, Linn. (n= 12, 24, and 36). The diploid forms constitute a complex assemblage, each form differing from the other in minor morphological characters, and have not directly contributed to the evolution of the naturally occurring tetraploids. Critical morphological and cytological ana-lyses have revealed that the tetraploids are distinct, closely resembling *S. luteum*, Mill in their morphology, cytology and in the chemical nature of fruit-pigments, indicating that the tetraploid may be a geographical race of *S. luteum*. The hexaploid forms occur mostly in the temperate parts and very rarely in the warmer regions.

The use of *S. nigrum* as stock for tomatoes to counteract the heat in North India has been suggested. The herb has antiseptic and antidysenteric properties and is given internally for cardalgia and gripe. An infusion of the plant is used as an enema in infants
having abdominal upsets. It is a household remedy for anthrax pustules and is applied locally. The plant is also credited with emollient, diuretic and laxative properties and its decoction is regarded as an antispasmodic and narcotic. Freshly prepared extract of the plant is effective in the treatment of irrhosis of the liver, and also serves as an antidote to opium poisoning. An alcoholic extract of leaves is active against *Staphylococcus aureus* and *Escherichia coli*.

Infusions or decoctions of the plant after transient stimulation, depress the central nervous system and the reflexes of the spinal cord. Small doses increase, and large doses decrease, cardiac activity; reduction in blood pressure is also evident; in the isolated rabbit car, vasodilation has been observed. Extracts of the plant affect the rate and amplitude of respiration; they have also an effect on the isolated ileum of guineapig. Decoctions of the plant may be used for the treatment of ascites in dogs.

Leaves are used in the treatment of scrofulous dyscrasias, and are said to produce diaphoresis when in overdose; they also cause nausea, purging and nervous disturbances. In China, leaves are applied to wounds and sores. The juice of fresh leaves is reported to produce dilatation of the pupil. In the Philippines, the pounded leaves are rubbed on depigmented areas of the body for restoring the pigment.

Leaves and tender shoots of *S. nigrum* are boiled in the same way as spinach and eaten in many parts of India, especially by patients suffering from dropsy. Ripe fruits are used in pies and
preserves; they are sometimes used as a substitute for raisins in plum puddings. Fruits make a delightful jam.

Analysis of leaves gave the following values (in 100 g. edible material): moisture, 82.1; protein, 5.9; fat, 1.0; minerals, 2.1; and carbohydrates, 8.9 g.; Ca, 410; P, 70; and Fe, 20.5 mg./100 g. Leaf is a rich source of riboflavin; the values for various vitamins present in the leaf are (in 100 g. edible material): riboflavin, 0.59; nicotinic acid, 0.92; and vitamin C, 11.0 mg. Higher values for vitamin C (20-40 mg./100 g.) have also been reported. Figures for plants growing in Pakistan are (mg./100g. material): leaves, 158.5-185.7; stems, 24.2-27.1; and fruit, 47.4-59.0. Leaves contain β-carotene (0.74 mg./100 g. material); α-carotene content is negligible. Citric acid is present to the extent of c. 5 per cent. A flavokinase (opt. pH 8.6; opt. temp. 40-45°) is present In leaves.

Berries are considered to possess tonic, diuretic and cathartic properties and are useful in anasarca and heart diseases. They are a domestic remedy for fevers, diarrhea, ulcers and eye troubles. Aqueous extracts of the ripe fruit inhibit choline esterase activity of human plasma.

Fruits contain glucose and fructose (15-20%), vitamin C and β-carotene. Green unripe fruits, however, contain glycoalkaloids and their eating is a toxic hazard to human beings as well as livestock. Ripe fruit contains very little alkaloids and can be consumed without ill-effects. Seeds, forming 9.5 percent of the weight of the fresh fruit, contain 17.5 per cent protein on dry weight basis. They yield a greenish yellow oil (21.5%) with the following physical and chemical constants: sp. gr.$^{30}$, 0.9198; n$^{25}$.
1-4712; acid val., 11.62; sap. val., 184.0; acet. val., 25.7; iod. val (Hanus), 123.2; Hehner val., 92.9; RM. val., 0.66; and unsaponifiable matter, 1.4%. The component fatty acids of the oil are linoleic, 46.63; oleic, 49.73; palmitic, 1-76; and stearic, 1.88%. The unsaponifiable matter contains sitosterol.

Immature green fruit of the plant contains four steroidal glycoalkaloids, viz. solamargine, solasonine and α- and β-solanigrine; all of them yield solasodine as the aglycone. It also contains a steroidal genin, tigogenin (m.p., 206-07°). Solamargine and solasonine are present also in leaves. The total alkaloid content of fruits and leaves are respectively 0.101 and 0.431 percent. Leaves of S. nigrum sometimes occur as an adulterant of Indian belladonna; they can be distinguished from belladonna microscopically.

Duthie (1903-1929) gave following account of Solanum xanthocarpum. A very prickly bright-green perennial herb, young parts stellate tomentoso Stem flex nose, woody at the base; branches many, armed with compressed straight or somewhat curved yellow glabrous shining prickling up to ½ in. long. Leaves 2-4 in long, ovate or elliptic, simulate or subpinnatifid, rounded and unequal-sided at the base, clothed especially beneath with stellate hairs. Ultimately glabrous, the midrib and often the main lateral nerves armed with long straight yellow spines, petioles up to 1 in. long. Flowers few, in extra-axillary shortly peduncled cyymes or solitary; pedicels curved, stellately hairy. Calyx 1/5 -1/2 in. long densely stellate-bairy and prickly; lobes linear-lanceolate, acute. Corolla bluish purple, 1 in. in diam; lobes acute, hairy outside,
Filaments glabrous. Ovary avoid, glabrous as also the style. Berry \( \frac{1}{2}-5/4 \) in. in diam. yellow or white streaked with green. Seeds glabrous.

Abundant within the area by roadsides and on waste ground. Flowers during the greater part of the year. Distrib: Throughout India, ascending to 7000 ft. on the Himalaya; also in Ceylon, extending to Malaya, Trop. Australia and Polynesia. All parts of the plant are used as ingredients of native medicines, and the fruits are said to be sometimes eaten.

**Solanum xanthocarpum**, Schrad & Wendl

**Family** — Solanaceae

**Description**—A low, diffused, spiny herb; leaves glabrous, oblong, 5-10 cm. long; flowers blue, 2.5 cm. in diameter, solitary or in small cymes, few; fruit a berry, rounded and about 2 cm. in diameter, whitish or green blotched, yellow when ripe.

Root-expectorant, used in cough, asthma, catarrhal fever and pain in chest; beaten up and mixed with wine given to check vomiting, leprosy, diuretic and febrifuge.

Juice of berries useful in sore throat.

Stem, flower and fruit-bitter, carminative, prescribed in burning of the feet in cases attended with a vesicular and watery eruption. Plant used in diuretic dropsy; in decoction used in gonorrhoea. Leaves applied locally to relieve pain: their juice given with black in rheumatism.

Buds and flowers with salt solution-good for watery eyes.
Distribution—Common in waste lands.

Place of representation collection—Shiwalik hills of district Saharanpur (U.P.)

Duthie (1903-1929) gave following account of Solanum nigrum. An erect nearly glabrous annual with much branched and somewhat angular stems. Leaves petioled 1-3 1/2 in. long, ovate or oblong, sinuate-toothed or lobed, petioles about 3/4 in. long. Flowers small, drooping-subumbellate on rather stout extra-axillary peduncles 1/4 - 3/4 in. long; pedicels 5-8, slender, 1/8 in. long. Calyx 1/8 in long, 5-toothed, glabrous or sparsely puberulous; teeth small, oblong, obtuse. Corolla white, rarely purple, 1/2 in. in diam., divided to below the middle into 5 oblong subacute lobes, glabrous outside. Filaments hairy at the base. Ovary globose, glabrous, style hairy towards the base. Berry 1/4 in. in diam., supported by the saucer-shaped calyx, black, less often red or yellow, smooth and shining. Seeds yellow, minutely pitted.

A common weed, especially in cultivated ground. Flowers chiefly during the cold season in the plains. DISTRIBUTION: Throughout India and up to 9,000 ft. on the W. Himalaya; also in Afghanistan, Baluchistan and in all temperate and tropical regions of the world. The berries and juice are used medicinally, and the leaves and young shoots are eaten as spinach.