# GOVERNMENT DEGREE COLLEGE, PALONCHA

BHADRADRI KOTHAGUDEM DISTRICT, TELANGANA – 507115
(Affiliated to Kakatiya University, Warangal)

# COLLEGE BEST PRACTICES

Provide quality education& all round development of the students, the collegeadopted and implementing certain best practices. The prime motto of these best practices is to provide sustainable & value base educationand eco-friendlyenvironment in internal & external activities to the students. These initiatives are taken up with the support of all the stakeholders of the college Staff members, Alumni, Parents & Students and NGOs.

Every best practice is adopted to mitigate certain issues of the students. These best practices will boost the students to compete in curricular & extra-curricular aspects.

The following best practices are implementing in the college.

1. Mid –Day meal program
2. Garden with QR Code system
3. Student Assembly – one day in a week.

## BEST PRACTISE –I

## MID –DAY MEAL PROGRAM:

Mid-Day meal program is one of the best practices in the college. The need of implementing this program is to fulfil the socio-economic and academic gaps of the students. As this college is operating in complete tribal location, most of the students are coming to the college from interior locations. We identified certain difficulties, gaps, problems of the students.

They are…

1. Students belong to mostly tribal villages which are located far from the college and not well connected with proper public transport.
2. Most of the students are socially & economically belongs to poor sections in the society.
3. They spend most of the time for travelling and likely to start from their homes well in advance at early timings in the morning to reach the college in time.

4. They have no time to prepare food for lunch and most of the times they are attending the college with empty stomach.
5. These hurdles impact on students learning, attendance & results.
6. Most importantly students are effecting with deficiencies of nutrition, haemoglobin, iodine and other health issues.

## PLANNING OF THE PROGRAM TO RESOLVE THE ISSUES:

1. On every semester, before two months to start of the examinations, Lunch is provided every student in the college. So that students are free from their food preparation in the morning time. It saves student quality time also.
2. Students are providing with nutritious and balanced food which is good combination of vegies & leaves.**Certain vegetables & leafy vegetables are cultivated and growing the campus with help of staff.**
3. Daily one boiled egg is supplied to every student to fulfil their balance diet intake.
4. As lunch is providing in the campus, Study hours & Remedial classes are conducting 3.30 pm to 4.30 pm every day.

## INAUGURAL OF THE PROGRAM:

The Mid-Day meal program is inaugurated by Sri D.Venkateswarlu, Additional District Collector, Bhadradri Kothagudem District. Sri R. Venkati, Principal of the college also can seen in the pictures.

## INVOLVEMENT OF STAKEHOLDERS IN THE PROGRAM:

1. Students are voluntarily participating in the program with their support to cooking staff. Class wise participation schedule is planned.
2. NSS Unit of the college is Supervising the entire program
3. Staff contributing fund to meet the expenditure.
4. Alumni is also actively involving & contributing the funds
5. Local NGOs participating in the program.
6. **Honourable district collector, bhadradri district, sanctioned funds of Rs. 1,32,325.00 (Rupees one lack thirty two thousand three hundred and twenty five) to meet the expenditure in academic year 2017 – 2018**

## COLLEGE STAFF PARTICIPATION & MONITORING:

## OUTCOME OF THE PROGRAM

With the initiative of the program on every semester as best practice in the college, students are benefited with academic improvement. As students are spending significant time in the college, their performance increased academically and it also reflecting in the examinations. Attendance of the students increased notably Students learning ability improved with interaction and active involvement in academic activities in the college.

Students’ health and physical standards also improved considerably.

## PRESS COVERAGE OF THE OF THE PROGRAM

Mid-Day program of the college covered in all the Telugu print & Electronic media.

# ప్రతిభ ఉన్న విద్యార్థులకు ఉజ్వల భవిష్యత్

విద్యార్థులకు మధ్యాహ్నభోజనం పెట్టి ప్రారంభిస్తున్న జేసీ

**కళాశాలలో మధ్యాహ్న భోజన సదుపాయం • జేసీ ఎం రాంకిషన్**

**లక్ష్మీదేవిపల్లి (పాల్వంచ రూరల్):** పోటీ ప్రపంచంలో విద్యలో ప్రతిభ కలిగిన విద్యార్థులకు ఉజ్వల భవిష్యత్ ఉందని జాయింట్ కలెక్టర్ ఎం.రాంకిషన్ అన్నారు. మండల పరిధి సోములగూడెం పంచాయతీ లక్ష్మీదేవిపల్లిలోని ప్రభుత్వ కళాశాలల్లో ఉపాధ్యాయుల సౌజన్యంతో నిర్వహిస్తున్న మధ్యాహ్న భోజన సదుపాయాన్ని శుక్రవారం జేసీ ప్రారంభించారు. ఈ సందర్భంగా జరిగిన కార్యక్రమానికి ముఖ్య అతిథిగా హాజరైన ఆయన మాట్లాడారు. ఆత్మ విశ్వాసం, చిత్తశుద్ధి, పట్టుదలతో చదువుకుంటే అందరికీ సమాన అవకాశాలు ఉంటాయన్నారు. ప్రభుత్వ విద్యాలయాల్లో చదువుకున్న విద్యార్థులకు చదువులపై పట్టు ఉంటుంది. ఎందుకంటే ప్రభుత్వ విద్యాలయాల్లోనే అర్హత కలిగిన ఉపాధ్యాయులు ఉండటం వలన సాధ్యమవుతుందన్నారు. ఇంగ్లిష్ అంటే జ్ఞానం అని భావించి విద్యార్థుల తల్లిదండ్రులు ప్రైవేట్ విద్యాలయాల్లో చేర్పిస్తున్నారు. వాస్తవానికి ఇంగ్లిష్ అంటే ఓ భాష మాత్రమే అని గుర్తుంచుకోవాలన్నారు. జపాన్, చైనా వంటి అభివృద్ధి చెందిన దేశాల్లో ఇంగ్లిష్ రాదన్నారు. కానీ అక్కడ అన్నిరంగాల్లో రాణిస్తున్నారు. ఇప్పటికైనా విద్యార్థుల తల్లిదండ్రులు తమ పిల్లలను ప్రభుత్వ విద్యాలయాల్లో చేర్పించాలన్నారు. నేటి సమాజంలో ప్రభుత్వ విద్యాలయాల్లో చదువుకుంటున్న విద్యార్థులు గర్వపడాలన్నారు. కళాశాల ప్రిన్సిపాల్ వెంకటి అధ్యక్షతన జరిగిన కార్యక్రమంలో తహసీల్దార్ గన్యా, ఎంపీడీఓ ధన్‌సింగ్, కళాశాల వైస్ ప్రిన్సిపాల్ సత్యవతి, సర్పంచ్ రాములు, మానస అకాడమీ డైరెక్టర్ ప్రభు కుమార్ తదితరులు పాల్గొన్నారు.

Sat, 11 February 2017
epaper.sakshi.com//c/16775221

### ప్రభుత్వ డిగ్రీ కళాశాలలో మధ్యాహ్న భోజన పథకం

**పాల్వంచ రూరల్, మార్చి 7, ప్రభాతవార్త :** మండల పరిధి లక్ష్మీదేవిపల్లిలోని పాల్వంచ ప్రభుత్వ డిగ్రీ కళాశాలలో మధ్యాహ్న భోజన పథకాన్ని శనివారం మున్సిపల్ కమీషనర్ చింతా శ్రీకాంత్ ప్రారంభించారు. ఈ సందర్భంగా ఆయన మాట్లాడుతూ..పరీక్షల సమయంలో కళాశాలలోనే విద్యార్థులకు మధ్యాహ్న భోజనం అందించడం ఎంతో ఉపయోగకరమన్నారు. సుదూర ప్రాంతాల నుండి కళాశాలకు వచ్చే విద్యార్థులకు ఈ పథకం ఓ వరమని కొనియాడారు. పౌష్టికాహారం అందిస్తున్న దాతలకు కళాశాల ప్రిన్సిపల్ డాక్టర్ వై.చిన్నప్పయ్య కృతజ్ఞతలు తెలిపారు. కళాశాలలో విద్యనభ్యసిస్తున్న సుమారు 400మంది విద్యార్థులకు ప్రతి రోజు మధ్యాహ్న భోజనం అందించనున్నట్లు పేర్కొన్నారు. ఈ కార్యక్రమంలో అధ్యాపకులు అబ్రహం, పూర్ణచందర్, సిబ్బంది పాల్గొన్నారు.

# విద్యార్థి దశలో డిగ్రీ కీలకం

భద్రాద్రి అడిషనల్ కలెక్టర్ వెంకటేశ్వర్లు ○ లక్ష్మీదేవిపల్లి డిగ్రీ కాలేజీ సందర్శన

Sat, 14 March 2020

### విద్యార్థులు చదువులో రాణిస్తూ సమాజంలో ఉన్నతంగా ఎదగాలి..

- మధ్యాహ్న భోజన పథకం విద్యార్థులకు వరం..
- జిల్లా అడిషనల్ కలెక్టర్ కె.వెంకటేశ్వర్లు

Sat, 14 March 2020

టు, రెండు ప్రైవేటు పాఠశాలలకు చెందిన 430

### 'మధ్యాహ్న భోజనాన్ని సద్వినియోగం చేసుకోవాలి'

**పాల్వంచ రూరల్, మార్చి13:** ప్రభుత్వ డిగ్రీ కళాశాలలో ఏర్పాటు చేసిన మధ్యాహ్న భోజన పథకాన్ని విద్యార్థులు సద్వినియోగం చేసుకోవాలని ఎంపీడీవో ఆల్బర్ట్ అన్నారు. బుధవారం పాల్వంచ మండలం లక్ష్మీదేవిపల్లిలోని ప్రభుత్వ డిగ్రీ కళాశాలలో ఏర్పాటు చేసిన మధ్యాహ్న బోజన పథకాన్ని ఆయన ప్రారంభించారు. ఈ సందర్భంగా ఆయన మాట్లాడుతూ గ్రామీణ ప్రాంతాల నుంచి డిగ్రీ కళాశాలకు వచ్చే విద్యార్థులు భోజన సమయంలో పడుతున్న ఇబ్బందులను దృష్టిలో ఉంచుకుని కళాశాల అధ్యాపక బృందం, దాతలు మధ్యాహ్న బోజన పథకాన్ని ఏర్పాటు చేశారని అన్నారు. ఈ కార్యక్రమంలో అతిథులు కేటీపీఎస్ సీఈ మూర్తి, ఎస్ఈ వరప్రసాద్, సర్పంచ్ విజయ్, కళాశాల మాజీ ప్రిన్సిపాల్ మొగిలేశ్వర్ రావు, సత్యవతి, అబ్రహం, కళాశాల ప్రిన్సిపాల్ చిన్నప్పయ్య, విజయ్ కుమార్, పూర్ణచంద్రరావు పాల్గొన్నారు.

మాట్లాడుతున్న ఎంపీడీవో ఆల్బర్ట్

### ప్రభుత్వ డిగ్రీ కళాశాలల్లో మధ్యాహ్న భోజనం ప్రారంభం

**పాల్వంచ సాంస్కృతికం, న్యూస్‌టుడే:** పాల్వంచలోని ప్రభుత్వ డిగ్రీ కళాశాలల్లో మధ్యాహ్న భోజన కార్యక్రమాన్ని ప్రారంభించారు. కళాశాల యాజమాన్యం, దాతల సహకారంతో బుధవారం ప్రారంభించారు. ఈ కార్యక్రమానికి ముఖ్య అతిథులుగా కేటీపీఎస్ సీఈ టీఎస్ఎన్‌మూర్తి, ఎస్‌ఈ వరప్రసాద్, ఎంపీడీవో అల్బర్ట్, లక్ష్మీదేవిపల్లి సర్పంచి విజయ్, కళాశాల విశ్రాంతి ప్రధానాచార్యుడు మొగిలీశ్వరరావు, సత్యవతి హాజరయ్యారు. ఈ సందర్భంగా ప్రధానాచార్యుడు మాట్లాడుతూ విద్యార్థుల పరీక్షలు, పేదరికాన్ని దృష్టిలో ఉంచుకొని ఈ కార్యక్రమాన్ని ఏర్పాటు చేశామన్నారు. దూర ప్రాంతాల నుంచి మారుమూల గ్రామాల నుంచి ఉదయాన్నే వస్తున్నారని, వారి ఆరోగ్యం దృష్ట్యా [illegible] ప్రారంభించామన్నారు.

భోజన కార్యక్రమాన్ని ప్రారంభిస్తున్న ప్రధానాచార్యుడు చిన్నప్పయ్య

# ప్రభుత్వ డిగ్రీ కళాశాలలో మధ్యాహ్న భోజనం

విద్యార్థులకు మధ్యాహ్న భోజనం వడ్డిస్తున్న దృశ్యం

**పాల్వంచరూరల్:** పేద విద్యార్థులకు అధ్యాపకులు, దాతల సహకారంతో ఉచితంగా మధ్యాహ్న భోజన సౌకర్యం కల్పించడం హర్షనీయమని ఎంపీడీఓ పీ.అల్బర్ట్ అన్నారు. మండల పరిధి లక్ష్మీదేవి పల్లిలోని ప్రభుత్వ డిగ్రీ కళాశాల అధ్యాపకులు, దాతల సహకారంతో ఆ కళాశాలలో ఏర్పాటు చేసిన ఉచిత మధ్యాహ్న భోజన పథకాన్ని బుధవారం ఎంపీడీఓ, కేటీపీఎస్ 5, 6 దశ చీఫ్ ఇంజనీర్ మూర్తి ప్రారంభించారు. ఈ సందర్భంగా ఎంపీడీఓ విద్యార్థులను ఉద్దేశించి మాట్లాడారు. ఈ కార్యక్రమంలో కేటీపీఎస్ ఎస్ఈ వరప్రసాద్, లక్ష్మీదేవిపల్లి సర్పంచ్ భూక్యా విజయ్‌కుమార్, మాజీ ప్రిన్సిపాల్ మోగిలేశ్వరరావు, సత్యావతి, అధ్యాపకులు అబ్రహం, విజయ్‌కుమార్, పూర్ణచందర్ రావు, పాలుదేవదానం, శ్రీనివాసరావు, శ్రీదేవి, రాంబాబు, షఫీ, శ్రీనివాస్ పాల్గొన్నారు.

### భోజన పథకాన్ని సద్వినియోగం చేసుకోవాలి: అదనపు కలెక్టర్

**పాల్వంచ సాంస్కృతికం, న్యూస్‌టుడే:** పాల్వంచ ప్రభుత్వ డిగ్రీ కళాశాలలో నిర్వహిస్తున్న 'మధ్యాహ్న భోజన' కార్యక్రమాన్ని పేద, దూరప్రాంత గ్రామీణ విద్యార్థులు సద్వినియోగం చేసుకోవాలని జిల్లా అదనపు కలెక్టర్ కర్నాటి వెంకటేశ్వర్లు సూచించారు. కళాశాలలో పాల్వంచ అంగన్‌వాడీ సీడీపీవో కనకదుర్గ ఆధ్వర్యంలో శుక్రవారం ఏర్పాటు చేసిన 'పోషణ పక్షం' కార్యక్రమానికి ఆయన ముఖ్యఅతిథిగా హాజరై ప్రసంగించారు. ఈ సందర్భంగా అదనపు కలెక్టర్ మాట్లాడుతూ అంగన్‌వాడీ కేంద్రాల్లో అందించే పోషకాహారాన్ని గర్భిణులు సద్వినియోగం చేసుకోవాలన్నారు. ఈ కార్యక్రమంలో కళాశాల ప్రధానాచార్యుడు చిన్నప్పయ్య, అధ్యాపకులు, అంగన్‌వాడీ సూపర్‌వైజర్లు వసంతరాణి, వెంకటరమణ, అనురాధ, కో ఆర్డినేటర్ సోని, మనీషా పాల్గొన్నారు.

అదనపు కలెక్టర్ వెంకటేశ్వర్లుకు జ్ఞాపిక అందిస్తున్న చిన్నప్పయ్య

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### మధ్యాహ్న భోజన ఏర్పాట్లు అభినందనీయం

భోజనం వడ్డిస్తున్న ప్రిన్సిపాల్ చిన్నప్పయ్య

### పదిలో వంద శాతం ఫలితాలు సాధించాలి

### గ్రామాల్లో కేంద్ర బృందం పర్యటన

# దాతల ఔదార్యం.. విద్యార్థులకు మధ్యాహ్న భోజనం

**పాల్వంచ సాంస్కృతికం, న్యూస్‌టుడే**

**ప్రభుత్వ డిగ్రీ కళాశాలల్లో పేద, గ్రామీణ విద్యార్థులు చదువుతుంటారు. కళాశాలకు వెళ్లాలంటే ఆర్టీసీ బస్సును ఆశ్రయించాల్సిందే. దూర ప్రాంతాల నుంచి కళాశాలకు హాజరవుతున్న పలువురు విద్యార్థులు సమయాభావం, ఇతర కారణాలతో కడుపు మాడ్చుకొని తరగతులు వినాల్సి వస్తోంది. దీంతో పాఠ్యాంశాలపై దృష్టి సారించలేకపోతున్నారు. కొందరు మధ్యాహ్నం కాగానే ఇంటిముఖం పడుతున్నారు. ఇలాంటి పరిస్థితిని గమనించిన పాల్వంచ ప్రభుత్వ డిగ్రీ కళాశాల ప్రధానాచార్యుడు యర్నం చిన్నప్పయ్య దాతల ఔదార్యంతో మధ్యాహ్న భోజనం ఏర్పాటుకు సంకల్పించారు. మధ్యాహ్న సమయంలో భోజనం బాధ తీరడంతో విద్యార్థులు ప్రతి రోజు కళాశాలకు హాజరవుతున్నారు. విద్యార్థులకు అందిస్తున్న మధ్యాహ్న భోజనంపై న్యూస్‌టుడే కథనం.**

దాతల ఔదార్యంతో పాల్వంచ ప్రభుత్వ డిగ్రీ కళాశాల విద్యార్థుల ఆకలి బాధ తీరింది. ప్రతి రోజు రెండు రకాల కూరలతో రుచికరమైన భోజనం వడ్డిస్తున్నారు. మార్చి 13న భోజన కార్యక్రమాన్ని ప్రారంభించారు. మే నెలలో విద్యార్థుల వార్షిక పరీక్ష జరిగే వరకు ఆహారం అందించనున్నారు. భోజనం ప్రారంభంతో కళాశాలలోని 350 మంది విద్యార్థులు లబ్ధి పొందుతున్నారు. బాల బాలికలకు ఆరోగ్యం, ఫలితాలు మెరుగుపరిచే లక్ష్యంతో ముందుకు సాగుతున్నారు.

భోజనం వడ్డించుకుంటున్న విద్యార్థులు

## ఆకలి బాధ తీరింది - వినోద, జీపీసీ, ద్వితీయ సంవత్సరం

ఇంట్లో నుంచి లంచ్ బాక్స్ తీసుకొస్తున్నాం. అయితే కొన్ని సమయాల్లో ఉదయం ఆలస్యం అవుతోంది. అప్పుడు బస్సు వెళ్లిపోతుంది. ఆ భయంతో మధ్యాహ్న భోజనం లేకుండానే కళాశాలకు రావాల్సి వస్తోంది. నాతో పాటు ఇతర ప్రాంతాల నుంచి వచ్చే వారందరి ఇదే పరిస్థితి. ఇప్పుడు ఆ పరిస్థితి లేదు. కళాశాలల్లో మధ్యాహ్న సమయానికి భోజనం వడ్డిస్తున్నారు.

## ప్రశాంతంగా కళాశాలకు వస్తున్నాం - సుందర్, బీకాం, తృతీయ సంవత్సరం

ఉదయం పూట వంట, బాక్సు అంటే సమయం సరిపోవడం లేదు. కళాశాలకు సరైన సమయంలో వెళ్లాలంటే విధిగా బస్సును అందుకోవాల్సిందే. ఒక బస్సు వెళ్తే గంట సమయం పాటు రోడ్లపై ఉండాల్సి వస్తోంది. ఇలాంటి పరిస్థితిలో లంచ్ బాక్సు లేకుండా కళాశాల రావాల్సి వస్తుంది. ప్రస్తుతం కళాశాలల్లో భోజనం వడ్డించడంతో ఆ బాధ తీరింది.

## అధ్యాపకుల సమష్టి కృషి - యర్నం చిన్నప్పయ్య, కళాశాల ప్రధానాచార్యుడు

అత్యధిక మంది విద్యార్థులకు ప్రయోజనకరమైన నిర్ణయం తీసుకున్నాం. ఎంతో మంది విద్యార్థులు ఆర్థాకలితో బాధపడుతున్నట్లు గమనించాను. చాలా మంది భోజనం తీసుకోకుండా రావడం చూశా. దీంతో మధ్యాహ్నం సమయానికే ఇంటి దారి పడుతున్నారు. దీంతో ఎలాగైన మధ్యాహ్న సమయంలో భోజనం ఏర్పాటు చేయాలని అనుకున్నాం. అధ్యాపకుల సమష్టి కృషితో ఇది సాధ్యమైంది.

# మధ్యాహ్న భోజనం విద్యార్థులకు వరం

**పాల్వంచరూరల్:** డిగ్రీ కళాశాల విద్యార్థులకు ఉచితంగా మధ్యాహ్న భోజనం అందించడం అద్భుతమైన కార్యక్రమమని, ఇది విద్యార్థులకు ఒక వరమని భద్రాద్రి జిల్లా అదనపు కలెక్టర్ కె.వెంకటేశ్వర్లు అన్నారు. మండల పరిధిలోని లక్ష్మీదేవిపల్లిలోని ప్రభుత్వ డిగ్రీ కళాశాలలో ఉచిత మధ్యాహ్న భోజన పథకం కార్యక్రమాన్ని శుక్రవారం ఆయన సందర్శించారు. అనంతరం మాట్లాడుతూ విద్యార్థులకు జీవితంలో గ్రాడ్యుయేషన్ అత్యంత విలువైన కాలమని, ఈ కాలాన్ని ఎవరైతే సంపూర్ణంగా చదువుకుని వినియోగించుకుంటారో వారు జీవితంలో మంచి స్థానాలకు వెళ్లే అవకాశం ఉంటుందన్నారు. తాను కూడా ప్రభుత్వ డిగ్రీ కళాశాలలో విద్యనభ్యసించి ఉస్మానియా యూనివర్సిటీలో పోస్ట్ గ్రాడ్యుయేషన్ చేసి ప్రజలకు సేవ చేయాలనే ఉద్దేశంతో ప్రభుత్వ ఉద్యోగాన్ని ఎంచుకున్నానన్నారు. తల్లిదండ్రులు తమ పిల్లలపై అనేక ఆశలు పెట్టుకుంటారని, వారు చదువులో రాణిస్తూ సమాజంలో ఉన్నతంగా ఎదగాలని కోరుకుంటారని, వారి ఆశలను, నమ్మకాన్ని నిలబెట్టుకోవాలని చెప్పారు. ప్రభుత్వం ప్రభుత్వ కళాశాలల్లో చదువుకునే విద్యార్థులకు అనేక సదుపాయాలు కల్పిస్తోందని, వాటిని వినియోగించుకొని ఉన్నత స్థానాలకు చేరుకోవాలన్నారు. విద్యార్థులకు నాణ్యమైన మధ్యాహ్న భోజన కార్యక్రమాన్ని అందిస్తున్న ప్రిన్సిపాల్‌ను అభినందించారు. కార్యక్రమంలో ప్రిన్సిపాల్ వై.చిన్నప్పయ్య, అధ్యాపకులు అబ్రహం, పి.విజయ్‌కుమార్, కె.వనజ, డాక్టర్ పూర్ణచంద్ర, డాక్టర్ పాల్‌దేవదానం, డాక్టర్ శ్రీనివాస్, రాంబాబు, షఫీ వైల్డ్‌లైఫ్ కోఆర్డినేటర్ రాజీకుమార్, పోషణ్ అభియాన్ డిస్ట్రిక్ట్ ఆఫీసర్ కొమ్మినేని బాబు, జీసీటీయూ అధికారి శేషు, ఐసీడీఎస్ సీడీపీవో ఎస్.కనకదుర్గ, సూపర్‌వైజర్ వెంకటరమణ, వసంత రాణి తదితరులు పాల్గొన్నారు.

మాట్లాడుతున్న కె.వెంకటేశ్వర్లు

సాక్షి Sat, 14 March 2020
https://epaper.sakshi.com/c/49939077

ఎత్తైన కొండ మీద కేవలం మెట్ల మార్గం ఉన్న దేవాల కూడా చెస్తున్నట్లు ఆయన తెలిపారు. కార్యక్రమంలో తదితరులు పాల్గొన్నారు.

# మధ్యాహ్న భోజన ఏర్పాట్లు అభినందనీయం

పాల్వంచ రూరల్, మార్చి 13: దూర ప్రాంతాల నుంచి విద్యనభ్యసించేందుకు వచ్చే విద్యార్థుల కోసం డిగ్రీ కళాశాల అధ్యాపకులు మధ్యాహ్నభోజన పథకాన్ని ప్రారంభించడం అభినందనీయం ఎంపీడీవో ఆల్బర్ట్ అన్నారు. బుధవారం మండలంలోని ప్రభుత్వ డిగ్రీ కళాశాల విద్యార్థులకు ఏర్పాటు చేసిన మధ్యాహ్న భోజన కార్యక్రమాన్ని ఆయన ప్రారంభించారు. దూర ప్రాంతాల నుంచి వచ్చే విద్యార్థులు లంచ్‌బాక్సులు తీసుకోకుండా వస్తున్నారని, వారిని దృష్టిలో ఉంచుకుని కళాశాల అధ్యాపకులు స్వచ్ఛందంగా ఈ కార్యక్రమాన్ని ఏర్పాటు చేయడం హర్షణీయమన్నారు. దీని వల్ల విద్యార్థులు సాయంత్రం వేళలో పూర్తి ఏకాగ్రతతో చదువుకునే వీలుంటుందన్నారు. డిగ్రీ పరీక్షలయ్యేంతవరకు ఈ సదుపాయం కొనసాగించడం సంతోషకరమని అధ్యాపకులను ప్రశంసించారు. ఈ కార్యక్రమంలో ప్రిన్సిపాల్ డాక్టర్ చిన్నప్పయ్య, కేటీపీఎస్ అధికారులు మూర్తి, వరప్రసాద్, మాజీ ప్రిన్సిపాల్ మోగిలేశ్వరావు, సత్యవతి, సర్పంచ్ విజయ్, అధ్యాపకులు పూర్ణచందర్‌రావు, అబ్రహం, దేవదానం, శ్రీనివాసరావు, శ్రీదేవి, రాంబాబు, షఫీ, శ్రీనివాస్, సౌమ్య తదితరులు పాల్గొన్నారు.

భోజనం వడ్డిస్తున్న ప్రిన్సిపాల్ చిన్నప్పయ్య

## పదిలో వంద శాతం ఫలితాలు సాధించాలి

## గ్రామాల్లో కేంద్ర బృందం పర్యటన

లక్ష్మీదేవిపల్లి, మార్చి 13: మండలంలోని రేగళ్ల, గట్టుమళ్ల గ్రామాల్లో కేంద్ర బృందం

Thu, 14 March 2019
https://epaper.ntnews.com/c/37576912

## BEST PRACTISE –II

## COLLEGE GARDEN WITH QR CODE SYSTEM:

Major & Small Industries like KothagudemThermal Power Station, NMDC Ltd, Nava BharatVentures Ltd located in Paloncha town. These industries causing air and dust pollution. This college is located in the vicinity of these Industries. To sustain the campus as pollution free another best practice is adopted to maintain the campus eco-friendlywith variety of plant community. This activity also engages the students in social responsible activities.

### PLANNING OF THE PROGRAM TO RESOLVE THE ISSUES:

1. It is decided to plant variety of plants such as Medicinal valued plants, Ornamental plants, botanically important plants & Environmental supporting plants.
2. Department of Botany planned to maintain a Botanical Garden in the campus and **every plant is recorded with a separate QR code about the features and characteristics of the plant.**
3. Eco club & NSS Unit of the college supervising the planting, maintenance of the Garden.
4. Students are planned to involve in clean & green program.
5. College is collaborated with Forest Department, Prohibition & Excise Department, and NGOs to maintain the campus Eco friendly.
6. Regular practice of participation in “Harithaharam” an initiative program of Government of Telangana is planned.

### INVOLVEMENT OF STAKEHOLDERS IN THE PROGRAM:

1. All the students are encouraged to involve actively in the plantation & maintenance of the garden.
2. All the staff members are involving in the programs initiated by Eco club & NSS Unit of the college.
3. Alumni is participating in the plantation programs
4. NGOs, Forest Department, Prohibition& Excise Department, and other local people representatives are involving in the programs organised by the college.

## STUDENTS INVOLVEMENT IN PLANTATION:





## STAFF INVOLVEMENT IN PLANTATION







## NGOS & OFFICERS FROM VARIOUS DEPARTMENTS INVOLVEMENT IN PLANTATION:

## VEGETABLES & BANANA CULTIVATION IN THE CAMPUS

## OUTCOME OF THE PROGRAM

With the initiative of the program, so far 3500 plants are planted in the campus and more than 3000 plants are survived with continuous clean & green programs and maintenance of the garden. With the facility of Botanical garden in the campus, students of Biological stream are comprehended about the plants. With QR code system, students are well aware instantly about the plant features, description, uses etc.,

The massive greenery in the campus also helped to sustain pollution free air in part of eco-friendly environment.

## QR CODE TO EVERY PLANT IN THE CAMPUS

## BEST PRACTISE –III

## STUDENTS ASSEMBLY – ONE DAY IN A WEEK:

College adopted STUDENTS ASSEMBLY – ONE DAY IN A WEEK as another important Best Practice. The theme of the program is to convey the students any important information related to their academic, institutional, career, examinations, etc,. Students Assembly aimed to review, discuss, and analyse any of the important International and National developments related to students and educational Institutions

This Best practice started in the Academic year 2013. From 2013 to 2018, on every Friday of a week Students Assembly has been organised. From 2018-19 the program is changed to every Monday of a week.

It is a best flat form to plan academic activities and guide the students whenever required.

Teachers & Special Invitees used this program to motivate the students in short time.

## SCHEDULE THE PROGRAM:

The Schedule of the program is as follows...

1. Senior Faculty member among teaching staff act as Coordinator to the program. He supervises and plans the program thoroughly.
2. Assembly starts before 15 minutes of commencing the first period.
3. Assembly starts with National song " VANDEMATARAM"
4. 1-2 staff members speaks on topics designed by Coordinator
5. 1-2 students speak on any of related to them.
6. Principal/ Special Invitee guide the students
7. Assembly concluded by National Anthem " JANA GANA MANA"


ప్రభుత్వ డిగ్రీ కళాశాల - పాల్వంచ


Shot on OnePlus


2020.03.02 10:08


ప్రభుత్వ డిగ్రీ కళాశాల-పాల్వంచ


N.S.S
2020.03.02 10:08


2020.03.02 10:09


2020.03.02 10:08

## 1. *Phyllanthus emblica*

### Classification

Kingdom: Plantae
Clade: Tracheophytes
Clade: Angiosperms
Clade: Eudicots
Clade: Rosids
Order: Malpighiales
Family: Phyllanthaceae
Genus: Phyllanthus
Species: P. emblica

### Introduction

Phyllanthus emblica, also known as emblic, emblic myrobalan, myrobalan, Indian gooseberry, Malacca Tree, or amla, from the Sanskrit amalaki, is a deciduous Tree of the family Phyllanthaceae.

### Plant morphology and harvesting

The Tree is small to medium in size, reaching 1–8 m (3 ft 3 in–26 ft 3 in) in height. The branchlets are not glabrous or finely pubescent, 10–20 cm (3.9–7.9 in) long, usually deciduous;

the leaves are simple, subsessile and closely set along branchlets, light green, resembling pinnate leaves. The flowers are greenish-yellow. The fruit is nearly spherical, light greenish-yellow, quite smooth and hard on appearance, with six vertical stripes or furrows.

Ripening in autumn, the berries are harvested by hand after climbing to upper branches bearing the fruits. The taste of Indian emblic is sour, bitter and astringent, and it is quite fibrous.

## Buddhist symbolism

In the Buddhist tradition, half an amalaka fruit was the final gift to the Buddhist sangha by the great Indian emperor Ashoka. This is illustrated in the Ashokavadana in the following verses: "A great donor, the lord of men, the eminent Maurya Ashoka, has gone from being lord of Jambudvipa to being lord of half a myrobalan" (Strong, 1983, p. 99). In Theravada Buddhism, this plant is said to have been used as the Tree for achieving enlightenment, or Bodhi, by the twenty first Buddha, named Phussa Buddha.

## Traditional uses

### Culinary use

The amla fruit is eaten raw or cooked into various dishes, such as dal (a lentil preparation) and amle ka murabbah, a sweet dish made by soaking the berries in sugar syrup until they are candied. It is raditionally consumed after meals.

In the Batak area of Sumatra, Indonesia, the inner bark is used to impart an astringent, bitter taste to the broth of a traditional fish soup known as holat.

### Traditional medicine

In traditional Indian medicine, dried and fresh fruits of the plant are used. All parts of the plant are used in various Ayurvedic medicine herbal preparations, including the fruit, seed, leaves, root, bark and flowers. According to Ayurveda, amla fruit is sour (amla) and astringent (kashaya) in taste (rasa), with sweet (madhura), bitter (tikta) and pungent (katu) secondary tastes (anurasas). Its qualities (gunas) are light (laghu) and dry (ruksha), the postdigestive effect (vipaka) is sweet (madhura) and its energy (virya) is cooling (shita).

In Ayurvedic polyherbal formulations, Indian gooseberry is a common constituent, and most notably is the primary ingredient in an ancient herbal rasayana called Chyawanprash.

### Other uses

Commonly used in inks, shampoos and hair oils, the high tannin content of Indian gooseberry fruit serves as a mordant for fixing dyes in fabrics.

## Chemical constituents

These fruits are reputed to contain high amounts of ascorbic acid (vitamin C), and have a bitter taste that may derive from a high density of ellagitannins, such as emblicanin A (37%), emblicanin B (33%), punigluconin (12%), and pedunculagin (14%). Amla also contains punicafolin and phyllanemblinin A, phyllanemblin other polyphenols, such as flavonoids, kaempferol, ellagic acid, and gallic acid.

**Source**

*https://en.wikipedia.org/wiki/Phyllanthus_emblica*

## 2. *Ocimum tenuiflorum* (తులసి, Tulasi)

**Classification**

Kingdom: Plantae
Clade: Tracheophytes
Clade: Angiosperms
Clade: Eudicots
Clade: Asterids
Order: Lamiales
Family: Lamiaceae
Genus: Ocimum
Species: O. tenuiflorum

Binomial name

Ocimum tenuiflorum L.

Synonyms

Geniosporum tenuiflorum (L.) Merr.
Lumnitzera tenuiflora (L.) Spreng.
Moschosma tenuiflorum (L.) Heynh.
Ocimum anisodorum F.Muell.
Ocimum caryophyllinum F.Muell.

## Introduction

Ocimum tenuiflorum, commonly known as holy basil or tulsi, is an aromatic perennial plant in the family Lamiaceae. It is native to the Indian subcontinent and widespread as a cultivated plant throughout the Southeast Asian tropics.

Tulsi is cultivated for religious and traditional medicine purposes, and also for its essential oil. It is widely used as a herbal tea, commonly used in Ayurveda, and has a place within the Vaishnava tradition of Hinduism, in which devotees perform worship involving holy basil plants or leaves.

The variety of Ocimum tenuiflorum used in Cambodian and Thai cuisine is referred to as Thai holy basil (Thai: กะเพรา kaphrao) or (Khmer: ម្រះព្រៅ mreah-pruv); it is not the same as Thai basil or Chi neang vorng, which is a variety of Ocimum basilicum.

## Morphology

Holy basil is an erect, many-branched subshrub, 30–60 cm (12–24 in) tall with hairy stems. Leaves are green or purple; they are simple, petioled, with an ovate blade up to 5 cm (2 in) long, which usually has a slightly toothed margin; they are strongly scented and have a decussate phyllotaxy. The purplish flowers are placed in close whorls on elongated racemes.

The three main morphotypes cultivated in India and Nepal are Ram tulsi (the most common type, with broad bright green leaves that are slightly sweet), the less common purplish green-leaved (Krishna or Shyam tulsi) and the common wild vana tulsi.

## Origin and distribution

DNA barcodes of various biogeographical isolates of tulsi from the Indian subcontinent are now available. In a large-scale phylogeographical study of this species conducted using chloroplast genome sequences, a group of researchers from Central University of Punjab, Bathinda, have found that this plant originates from North-Central India.

This basil has now escaped from cultivation and has naturalised into a cosmopolitan distribution.

## Chemical composition

Some of the phytochemical constituents of tulsi are oleanolic acid, ursolic acid, rosmarinic acid, eugenol, carvacrol, linalool, and β-caryophyllene (about 8%).

Tulsi essential oil consists mostly of eugenol (~70%) β-elemene (~11.0%), β-caryophyllene (~8%), and germacrene (~2%), with the balance being made up of various trace compounds, mostly terpenes.

## Genome sequence

The genome of the tulsi plant has been sequenced and reported as a draft, estimated to be 612 mega bases, with results showing genes for biosynthesis of anthocyanins in Shyama Tulsi, ursolic acid and eugenol in Rama Tulsi.

## Uses

Tulsi (Sanskrit:-Surasa) has been used in Ayurveda and Siddha practices for its supposed treatment of diseases.

For centuries, the dried leaves have been mixed with stored grains to repel insects.

## Significance in Hinduism

Tulsi is a sacred plant for Hindus. It is worshipped as the avatar of Lakshmi, and may be planted in courtyards of Hindu houses or Hanuman temples. The ritual lighting of lamps each evening during Kartik includes the worship of the tulsi plant. Vaishnavas followers of Vishnu are known as "those who bear the tulsi around the neck".

Tulsi Vivah is a ceremonial festival performed between Prabodhini Ekadashi (the 11th or 12th lunar day of the bright fortnight of the Hindu month of Kartik) and Kartik Poornima (the full moon of the month).

## Source

*https://en.wikipedia.org/wiki/Ocimum_tenuiflorum*

## 3. *Catharanthus roseus* (బిళ్ళ గన్నేరు, Billa Ganneru)

**Classification**

Kingdom: Plantae
Clade: Tracheophytes
Clade: Angiosperms
Clade: Eudicots
Clade: Asterids
Order: Gentianales
Family: Apocynaceae
Genus: Catharanthus
Species: C. roseus

Binomial name

Catharanthus roseus (L.) G.Don

Synonyms

Vinca rosea L.
Pervinca rosea (L.) Gaterau
Lochnera rosea (L.) Rchb. ex Spach
Ammocallis rosea (L.) Small

## Introduction

Catharanthus roseus, commonly known as bright eyes, Cape periwinkle, graveyard plant, Madagascar periwinkle, old maid, pink periwinkle, rose periwinkle, is a species of flowering plant in the family Apocynaceae. It is native and endemic to Madagascar, but grown elsewhere as an ornamental and medicinal plant. It is a source of the drugs vincristine and vinblastine, used to treat cancer. It was formerly included in the genus Vinca as Vinca rosea.

## Description

Catharanthus roseus is an evergreen subshrub or herbaceous plant growing 1 m (39 in) tall. The leaves are oval to oblong, 2.5–9 cm (1.0–3.5 in) long and 1–3.5 cm (0.4–1.4 in) broad, glossy green, hairless, with a pale midrib and a short petiole 1–1.8 cm (0.4–0.7 in) long; they are arranged in opposite pairs. The flowers are white to dark pink with a darker red centre, with a basal tube 2.5–3 cm (1.0–1.2 in) long and a corolla 2–5 cm (0.8–2.0 in) diameter with five petal-like lobes. The fruit is a pair of follicles 2–4 cm (0.8–1.6 in) long and 3 mm (0.1 in) broad.

## Ecology

In the wild, C. roseus is an endangered plant; the main cause of decline is habitat destruction by slash and burn agriculture. It is also, however, widely cultivated and is naturalized in subtropical and tropical areas of the world like Australia, Malaysia, India, Pakistan and Bangladesh. It is so well adapted to growth in Australia that it is listed as a noxious weed in Western Australia and the Australian Capital Territory, and also in parts of eastern Queensland.

## Cultivation

As an ornamental plant, it is appreciated for its hardiness in dry and nutritionally deficient conditions, popular in subtropical gardens where temperatures never fall below 5–7 °C (41–45 °F), and as a warm-season bedding plant in temperate gardens. It is noted for its long flowering period, throughout the year in tropical conditions, and from spring to late autumn, in warm temperate climates. Full sun and well-drained soil are preferred. Numerous cultivars have been selected, for variation in flower colour (white, mauve, peach, scarlet and reddish-orange), and also for tolerance of cooler growing conditions in temperate regions. Notable cultivars include 'Albus' (white flowers), 'Grape Cooler' (rose-pink; cool-tolerant), the Ocellatus Group (various colours), and 'Peppermint Cooler' (white with a red centre; cool-tolerant). In the USA it often remains identified as "Vinca" although botanists have shifted its identification and it often can be seen growing along roadsides in the south.

## Uses

### Traditional

The species has long been cultivated for herbal medicine, as it can be traced back to 2600 B.C.E. Mesopotamia. In Ayurveda (Indian traditional medicine) the extracts of its roots and shoots, though poisonous, are used against several diseases. In traditional Chinese medicine, extracts from it have been used against numerous diseases, including diabetes, malaria, and Hodgkin's lymphoma. In the 1950s, vinca alkaloids, including vinblastine and vincristine, were isolated from Catharanthus roseus while screening for anti-diabetic drugs.This chance discovery led to increased research into the chemotheraputic effects of vinblastine and vincristine. Conflict between historical indigenous use, and recent patents on C. roseus-derived drugs by western pharmaceutical companies, without compensation, has led to accusations of biopiracy.

## Medicinal

Vinblastine and vincristine , chemotherapy medications used to treat several types of cancers, are found in the plant and are biosynthesised from the coupling of the alkaloids catharanthine and vindoline.The newer semi-synthetic chemotherapeutic agent vinorelbine, used in the treatment of non-small-cell lung cancer,can be prepared either from vindoline and catharanthineor from the vinca alkaloid leurosine, in both cases via anhydrovinblastine.The insulin-stimulating vincoline has been isolated from the plant.

## Research

Despite the medical importance and wide use, the desire alkaloids (vinblastine and vincristine) are naturally produced at very low yields. Additionally, it is complex and costly to synthesize the desired products in a lab, resulting in difficulty satisfying the demand and a need for overproduction. Treatment of the plant with phytohormones, such as salicylic acid and methyl jasmonate, has been shown to trigger defense mechanisms and overproduce downstream alkaloids. Studies utilizing this technique vary in growth conditions, choice of phytohormone, and location of treatment. Concurrently, there are various efforts to map the biosynthetic pathway producing the alkaloids to find a direct path to overproduction via genetic engineering.

C. roseus is used in plant pathology as an experimental host for phytoplasmas.[39] This is because it is easy to infect with a large majority of phytoplasmas, and also often has very distinctive symptoms such as phyllody and significantly reduced leaf size.

## Biology

Rosinidin is the pink anthocyanidin pigment found in the flowers of C. roseus. Lochnericine is a major alkaloid in roots.

## Toxicity

C. roseus can be extremely toxic if consumed orally by humans, and is cited (under its synonym Vinca rosea) in the Louisiana State Act 159. All parts of the plant are poisonous. On consumption, symptoms consist of mild stomach cramps, cardiac complications, hypotension, and systematic paralysis eventually leading to death.

**Source**

*https://en.wikipedia.org/wiki/Catharanthus_roseus*

## 4. *Azadirachta indica* (Neem)

**Classification**
Kingdom: Plantae
Clade: Tracheophytes
Clade: Angiosperms
Clade: Eudicots
Clade: Rosids
Order: Sapindales
Family: Meliaceae
Genus: Azadirachta
Species: A. indica

Binomial name
Azadirachta indica
A.Juss., 1830

## Introduction

Azadirachta indica, commonly known as neem, nimTree or Indian lilac, and in Nigeria called dogoyaro or dogonyaro, is a Tree in the mahogany family Meliaceae. It is one of two species in the genus Azadirachta, and is native to the Indian subcontinent and most of the countries in Africa. It is typically grown in tropical and semi-tropical regions. Neem Trees also grow on islands in southern Iran. Its fruits and seeds are the source of neem oil.

## Description

Neem is a fast-growing Tree that can reach a height of 15–20 metres (49–66 ft), and rarely 35–40 m (115–131 ft). It is deciduous, shedding many of its leaves during the dry winter months. The branches are wide and spreading. The fairly dense crown is roundish and may reach a diameter of 20–25 m (66–82 ft). The neem Tree is similar in appearance to its relative, the chinaberry (Melia azedarach).

The opposite, pinnate leaves are 20–40 cm (8–16 in) long, with 20 to 30 medium to dark green leaflets about 3–8 cm (1+1⁄4–3+1⁄4 in) long. The terminal leaflet often is missing. The petioles are short.

White and fragrant flowers are arranged in more-or-less drooping axillary panicles which are up to 25 cm (10 in) long. The inflorescences, which branch up to the third degree, bear from 250 to 300 flowers. An individual flower is 5–6 mm (3⁄16–1⁄4 in) long and 8–11 mm (5⁄16–7⁄16 in) wide. Protandrous, bisexual flowers and male flowers exist on the same individual Tree.

The fruit is a smooth (glabrous), olive-like drupe which varies in shape from elongate oval to nearly roundish, and when ripe is 14–28 mm (1⁄2–1+1⁄8 in) by 10–15 mm (3⁄8–5⁄8 in). The fruit skin (exocarp) is thin and the bitter-sweet pulp (mesocarp) is yellowish-white and very fibrous. The mesocarp is 3–5 mm (1⁄8–1⁄4 in) thick. The white, hard inner shell (endocarp) of the fruit encloses one, rarely two, or three, elongated seeds (kernels) having a brown seed coat.

The neem Tree is often confused with a similar looking Tree called bakain. Bakain also has toothed leaflets and similar looking fruit. One difference is that neem leaves are pinnate but bakain leaves are twice and thrice pinnate.

## Etymology

Neem (नीम) is a Hindi noun derived from Sanskrit Nimba (निंब).

## Ecology

The neem Tree is noted for its drought resistance. Normally it thrives in areas with sub-arid to sub-humid conditions, with an annual rainfall of 400–1,200 mm (16–47 in). It can grow in regions with an annual rainfall below 400 mm, but in such cases it depends largely on ground water levels. Neem can grow in many different types of soil, but it thrives best on well drained deep and sandy soils. It is a typical tropical to subtropical Tree and exists at annual mean temperatures of 21–32 °C (70–90 °F). It can tolerate high to very high temperatures and does not tolerate temperature below 5 °C (41 °F). Neem is one of a very few shade-giving Trees that thrive in drought-prone areas e.g. the dry coastal, southern districts of India, and Pakistan. The Trees are not at all delicate about water quality and thrive on the merest trickle of water, whatever the quality. In India and tropical countries where the Indian diaspora has reached, it is very common to see neem Trees used for shade lining sTreets, around temples, schools and other such public buildings or in most people's back yards. In very dry areas the Trees are planted on large tracts of land.

## Weed status

Neem is considered as a weed in many areas, including some parts of the Middle East, most of Sub-Saharan Africa including West Africa and Indian Ocean states, and some parts of Australia. Ecologically, it survives well in similar environments to its own, but its weed potential has not been fully assessed.

In April 2015, A. indica was declared a class B and C weed in the Northern Territory, Australia, meaning its growth and spread must be controlled and plants or propagules are not allowed to be brought into the NT. It is illegal to buy, sell, or transport the plants or seeds. Its declaration as a weed came in response to its invasion of waterways in the "Top End" of the territory.

After being introduced into Australia, possibly in the 1940s, A. indica was originally planted in the Northern Territory to provide shade for cattle. Trial plantations were established between the 1960s and 1980s in Darwin, Queensland, and Western Australia, but the Australian neem industry did not prove viable. The Tree has now spread into the savanna, particularly around waterways, and naturalised populations exist in several areas.

## Phytochemicals

Neem fruit, seeds, leaves, stems, and bark contain diverse phytochemicals, some of which were first discovered in azadirachta seed extracts, such as azadirachtin established in the 1960s as an insect antifeedant, growth disruptor, and insecticide. The yield of azadirachtin from crushing 2 kg of seeds is about 5 g.

In addition to azadirachtin and related limonoids, the seed oil contains glycerides, diverse polyphenols, nimbolide, triterpenes, and beta-sitosterol. The yellow, bitter oil has a garlic-like odor and contains about 2% of limonoid compounds. The leaves contain quercetin, catechins, carotenes, and vitamin C.

## Uses

Neem leaves are dried in India and placed in cupboards to prevent insects eating the clothes, and also in tins where rice is stored. The flowers are also used in many Indian festivals like Ugadi. See below: #Association with Hindu festivals in India.

## As a vegetable

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The tender shoots and flowers of the neem Tree are eaten as a vegetable in India. A soup-like dish called veppampoo charu in Tamil (translated as "neem flower rasam") made of the flower of neem is prepared in Tamil Nadu. In Bengal, young neem leaves are fried in oil with tiny pieces of eggplant (brinjal). The dish is called neem begun bhaja and is the first item during a Bengali meal that acts as an appetizer. It is eaten with rice.

Neem is used in parts of mainland Southeast Asia, particularly in Cambodia, Laos (where it is called kadao), Thailand (where it is known as sa-dao or sdao), Myanmar (where it is known as Tamar) and Vietnam (where it is known as sầu đâu and is used to cook the salad gỏi sầu đâu). Even if lightly cooked, the flavour is quite bitter, and the food is not consumed by all inhabitants of these nations. In Myanmar, young neem leaves and flower buds are boiled with tamarind fruit to soften its bitterness and eaten as a vegetable. Pickled neem leaves are also eaten with tomato and fish paste sauce in Myanmar.

### Traditional medicine

Products made from neem Trees have been used in the traditional medicine of India for centuries, but there is insufficient clinical evidence to indicate any benefits of using neem for medicinal purposes. In adults, no specific doses have been established, and short-term use of neem appears to be safe, while long-term use may harm the kidneys or liver; in small children, neem oil is toxic and can lead to death. Neem may also cause miscarriages, infertility, and low blood sugar.

### Pest and disease control

Neem is a key ingredient in non-pesticidal management (NPM), providing a natural alternative to synthetic pesticides. Neem seeds are ground into powder that is soaked overnight in water and sprayed on the crop. To be effective, it must be applied repeatedly, at least every ten days. Neem does not directly kill insects. It acts as an anti-feedant, repellent, and egg-laying deterrent and thus protects the crop from damage. The insects starve and die within a few days. Neem also suppresses the subsequent hatching of their eggs. Neem-based fertilizers have been effective against southern armyworm. Neem cake is may be used as a fertilizer.

Neem oil has been shown to avert termite attack as an ecofriendly and economical agent.

### Neem oil for polymeric resins

Applications of neem oil in the preparation of polymeric resins have been documented in the recent reports. The synthesis of various alkyd resins from neem oil is reported using a monoglyceride (MG) route and their utilization for the preparation of PU coatings. The alkyds are prepared from reaction of conventional divalent acid materials like phthalic and maleic anhydrides with MG of neem oil.

### Other uses

- Tree: The neem tree is of great importance for its anti-desertification properties and possibly as a good carbon dioxide sinks. It is also used for maintaining soil fertility.
- Fertilizer: neem extract is added to fertilizers (urea) as a nitrification inhibitor.
- Animal feed: neem leaves can be occasionally used as forage for ruminants and rabbits.
- Teeth cleaning: neem has traditionally been used as a type of teeth-cleaning twig.

### Safety issues

Neem oil has the ability to cause some forms of toxic encephalopathy and ophthalmopathy if consumed in any quantity.

In March 2020, false claims were circulated on social media in various Southeast Asian countries and Africa, supporting the use of neem leaves to treat COVID-19. The Malaysian Ministry of Health summarized myths related to using the leaves to treat COVID-19, and warned of health risks from over-consumption of the leaves.There is no evidence for the effectiveness of neem leaves in the treatment of COVID-19.

## Genome and transcriptomes

Neem genome and transcriptomes from various organs have been sequenced, analyzed, and published by Ganit Labs in Bangalore, India.

ESTs were identifying by generation of subtractive hybridization libraries of neem fruit, leaf, fruit mesocarp, and fruit endocarp by CSIR-CIMAP Lucknow.

## Cultural and social impact

The name Nimai ('born under a neem Tree'), of the Bhakti movement Vaishnava saint and Chaitanya Mahaprabhu (believed to be an incarnation of Radha Krishna in Gaudiya Vaishnavism and ISKCON) is due to his birth under a neem Tree.

In 1995, the European Patent Office (EPO) granted a patent on an anti-fungal product derived from neem to the United States Department of Agriculture and W. R. Grace and Company. The Indian government challenged the patent when it was granted, claiming that the process for which the patent had been granted had been in use in India for more than 2,000 years. In 2000, the EPO ruled in India's favour, but W. R. Grace appealed, claiming that prior art about the product had never been published in a scientific journal. On 8 March 2005, that appeal was lost and the EPO revoked the Neem patent.

## Biotechnology

The biopesticide produced by extraction from the Tree seeds contains limonoid triterpenes. Currently, the extraction process has disadvantages such as contamination with fungi and heterogeneity in the content of limonoids due to genetic, climatic, and geographical variations. To overcome these problems, production of limonoids from plant cell suspension and hairy root cultures in bioreactors has been studied, including the development of a two-stage bioreactor process that enhances growth and production of limonoids with cell suspension cultures of A. indica.

## Source

*https://en.wikipedia.org/wiki/Azadirachta_indica*

## 5. *Citrus* (నిమ్మ, Nimma)

**Classification**

Kingdom: Plantae
Clade: Tracheophytes
Clade: Angiosperms
Clade: Eudicots
Clade: Rosids
Order: Sapindales
Family: Rutaceae
Subfamily: Aurantioideae
Genus: Citrus

L.

Species and hybrids
Ancestral species:
Citrus maxima – Pomelo
Citrus medica – Citron
Citrus reticulata – Mandarin orange
Citrus micrantha – a papeda
Citrus hystrix – Kaffir lime
Citrus cavaleriei – Ichang papeda
Citrus japonica – Kumquat
Important hybrids:
Citrus × aurantiifolia – Key lime
Citrus × aurantium – Bitter orange
Citrus × latifolia – Persian lime
Citrus × limon – Lemon
Citrus × limonia – Rangpur
Citrus × paradisi – Grapefruit
Citrus × sinensis – Sweet orange
Citrus × tangerina – Tangerine
Synonyms

Aurantium Mill.
Citreum Mill.
×Citrofortunella J.W.Ingram & H.E.Moore
×Citroncirus J.W.Ingram & H.E.Moore
Citrophorum Neck.
Eremocitrus Swingle

Feroniella Swingle
Fortunella Swingle
Limon Mill.
Microcitrus Swingle
Oxanthera Montrouz.
Papeda Hassk.
Pleurocitrus Tanaka
Poncirus Raf.
Pseudaegle Miq.
Sarcodactilis C.F.Gaertn.

## Introduction

Citrus is a genus of flowering Trees and shrubs in the rue family, Rutaceae. Plants in the genus produce citrus fruits, including important crops such as oranges, lemons, grapefruits, pomelos, and limes. The genus Citrus is native to South Asia, East Asia, Southeast Asia, Melanesia, and Australia. Various citrus species have been used and domesticated by indigenous cultures in these areas since ancient times. From there its cultivation spread into Micronesia and Polynesia by the Austronesian expansion (c. 3000–1500 BCE); and to the Middle East and the Merranean (c. 1200 BCE) via the incense trade route, and onwards to Europe.

## History

Citrus plants are native to subtropical and tropical regions of Asia, Island Southeast Asia, Near Oceania, and northeastern Australia. Domestication of citrus species involved much hybridization and introgression, leaving much uncertainty about when and where domestication first happened. A genomic, phylogenic, and biogeographical analysis by Wu et al. (2018) has shown that the center of origin of the genus Citrus is likely the southeast foothills of the

Himalayas, in a region stretching from eastern Assam, northern Myanmar, to western Yunnan. It diverged from a common ancestor with Poncirus trifoliata. A change in climate conditions during the Late Miocene (11.63 to 5.33 mya) resulted in a sudden speciation event. The species resulting from this event include the citrons (Citrus medica) of South Asia; the pomelos (C. maxima) of Mainland Southeast Asia; the mandarins (C. reticulata), kumquats (C. japonica), mangshanyegan (C. mangshanensis), and ichang papedas (C. cavaleriei) of southeastern China; the kaffir limes (C. hystrix) of Island Southeast Asia; and the biasong and samuyao (C. micrantha) of the Philippines.

This was later followed by the spread of citrus species into Taiwan and Japan in the Early Pliocene (5.33 to 3.6 mya), resulting in the tachibana orange (C. tachibana); and beyond the Wallace Line into Papua New Guinea and Australia during the Early Pleistocene (2.5 million to 800,000 years ago), where further speciation events occurred resulting in the Australian limes.

The earliest introductions of citrus species by human migrations was during the Austronesian expansion (c. 3000–1500 BCE), where Citrus hystrix, Citrus macroptera, and Citrus maxima were among the canoe plants carried by Austronesian voyagers eastwards into Micronesia and Polynesia.

The citron (Citrus medica) was also introduced early into the Merranean basin from India and Southeast Asia. It was introduced via two ancient trade routes: an overland route through Persia, the Levant and the Merranean islands; and a maritime route through the Arabian Peninsula and Ptolemaic Egypt into North Africa. Although the exact date of the original introduction is unknown due to the sparseness of archaeobotanical remains, the earliest evidence are seeds recovered from the Hala Sultan Tekke site of Cyprus, dated to around 1200 BCE. Other archaeobotanical evidence include pollen from Carthage dating back to the 4th century BCE; and carbonized seeds from Pompeii dated to around the 3rd to 2nd century BCE. The earliest complete description of the citron was first attested from Theophrastus, c. 310 BCE. The agronomists of classical Rome made many references to the cultivation of citrus fruits within the limits of their empire.

Lemons, pomelos, and sour oranges are believed to have been introduced to the Merranean later by Arab traders at around the 10th century CE; and sweet oranges by the Genoese and Portuguese from Asia during the 15th to 16th century. Mandarins were not introduced until the 19th century. This group of species has reached great importance in some of the Merranean countries, and in the case of orange, mandarin, and lemon Trees, they found here soil and climatic conditions which allow them to achieve a high level of fruit quality, even better than in the regions from where they came.

In cooler parts of Europe, citrus fruit was grown in orangeries starting in the 17th century; many were as much status symbols as functional agricultural structures.

## Etymology

The generic name originated from Latin, where it referred to either the plant now known as citron (C. medica) or a conifer Tree (Thuja). It is related to the ancient Greek word for cedar, κέδρος (kédros). This may be due to perceived similarities in the smell of citrus leaves and fruit with that of cedar. Collectively, Citrus fruits and plants are also known by the Romance loanword agrumes (literally "sour fruits").

## Evolution

The large citrus fruit of today evolved originally from small, edible berries over millions of years. Citrus species began to diverge from a common ancestor about 15 million years ago; at about the same time that Severinia (such as the Chinese box orange) diverged from the same ancestor. About 7 million years ago, the ancestors of Citrus split into the main genus, Citrus, and the genus Poncirus (such as the trifoliate orange), which is closely enough related that it can still be hybridized with all other citrus and used as rootstock. These estimates are made using genetic mapping of plant chloroplasts. A DNA study published in Nature in 2018 concludes that the genus Citrus first evolved in the foothills of the Himalayas, in the area of Assam (India), western Yunnan (China), and northern Myanmar.

The three ancestral (sometimes characterized as "original" or "fundamental") species in the genus Citrus associated with modern Citrus cultivars are the mandarin orange, pomelo, and citron. Almost all of the common commercially important citrus fruits (sweet oranges, lemons, grapefruit, limes, and so on) are hybrids involving these three species with each other, their main progenies, and other wild Citrus species within the last few thousand years.

## Fossil record

A fossil leaf from the Pliocene of Valdarno (Italy) is described as †Citrus meletensis. In China, fossil leaf specimens of †Citrus linczangensis have been collected from coal-bearing strata of the Bangmai Formation in the Bangmai village, about 10 km (6 miles) northwest of Lincang City, Yunnan. The Bangmai Formation contains abundant fossil plants and is considered to be of late Miocene age. Citrus linczangensis and C. meletensis share some important characters, such as an intramarginal vein, an entire margin, and an articulated and distinctly winged petiole.

## Taxonomy

Three-dimensional projection of a principal component analysis of citrus hybrids, with citron (yellow), pomelo (blue), mandarin (red), and micrantha (green) defining the axes. Hybrids are expected to plot between their parents. ML: ‘Mexican’ lime; A: ‘Alemow’; V: ‘Volkamer’ lemon; M: ‘Meyer’ lemon; L: Regular and ‘Sweet’ lemons; B: Bergamot orange; H: Haploid clementine; C: Clementines; S: Sour oranges; O: Sweet oranges; G: Grapefruits. Figure from Curk, et al. (2014).

The taxonomy and systematics of the genus are complex and the precise number of natural species is unclear, as many of the named species are hybrids clonally propagated through seeds (by apomixis), and genetic evidence indicates that even some wild, true-breeding species are of hybrid origin.

Most cultivated Citrus spp. seem to be natural or artificial hybrids of a small number of core ancestral species, including the citron, pomelo, mandarin, and papeda (see image).Natural and cultivated citrus hybrids include commercially important fruit such as oranges, grapefruit, lemons, limes, and some tangerines.

Apart from these core citrus species, Australian limes and the recently discovered mangshanyegan are grown. Kumquats and Clymenia spp. are now generally considered to belong within the genus Citrus.Trifoliate orange, which is often used as commercial rootstock, is an outgroup and may or may not be categorized as a citrus.

Phylogenetic analysis suggested the species of Oxanthera from New Caledonia, commonly known as false oranges, should be transferred to the genus Citrus.The transfer has been accepted.

## Description

### Tree

These plants are large shrubs or small to moderate-sized Trees, reaching 5–15 m (16–49 ft) tall, with spiny shoots and alternately arranged evergreen leaves with an entire margin.The flowers are solitary or in small corymbs, each flower 2–4 cm (0.79–1.57 in) diameter, with five (rarely four) white petals and numerous stamens; they are often very strongly scented, due to the presence of essential oil glands.

### Fruit

The fruit is a hesperidium, a specialised berry, globose to elongated,4–30 cm (1.6–11.8 in) long and 4–20 cm (1.6–7.9 in) diameter, with a leathery rind or "peel" called a pericarp. The outermost layer of the pericarp is an "exocarp" called the flavedo, commonly referred to as the zest. The middle layer of the pericarp is the mesocarp, which in citrus fruits consists of the white, spongy "albedo", or "pith". The innermost layer of the pericarp is the endocarp. The space inside each segment is a locule filled with juice vesicles, or "pulp". From the endocarp, string-like "hairs" extend into the locules, which provide nourishment to the fruit as it develops. Many citrus cultivars have been developed to be seedless (see nucellar embryony and parthenocarpy) and easy to peel.

Citrus fruits are notable for their fragrance, partly due to flavonoids and limonoids (which in turn are terpenes) contained in the rind, and most are juice-laden. The juice contains a high quantity of citric acid and other organic acids giving them their characteristic sharp flavour. The genus is commercially important as many species are cultivated for their fruit, which is eaten fresh, pressed for juice, or preserved in marmalades and pickles.

They are also good sources of vitamin C. The content of vitamin C in the fruit depends on the species, variety, and mode of cultivation. The flavonoids include various flavanones and flavones.

## Cultivation

Lemons are a citrus fruit native to Asia, but now common worldwide.

Citrus Trees hybridise very readily – depending on the pollen source, plants grown from a Persian lime's seeds can produce fruit similar to grapefruit. Thus, all commercial citrus cultivation uses Trees produced by grafting the desired fruiting cultivars onto rootstocks selected for disease resistance and hardiness.

The colour of citrus fruits only develops in climates with a (diurnal) cool winter. In tropical regions with no winter at all, citrus fruits remain green until maturity, hence the tropical "green oranges". The Persian lime in particular is extremely sensitive to cool conditions, thus it is not usually exposed to cool enough conditions to develop a mature colour. If they are left in a cool place over winter, the fruits will change colour to yellow.

The terms "ripe" and "mature" are usually used synonymously, but they mean different things. A mature fruit is one that has completed its growth phase. Ripening is the changes that occur within the fruit after it is mature to the beginning of decay. These changes usually involve starches converting to sugars, a decrease in acids, softening, and change in the fruit's colour.

Citrus fruits are nonclimacteric and respiration slowly declines and the production and release of ethylene is gradual. The fruits do not go through a ripening process in the sense that they become "Tree ripe". Some fruits, for example cherries, physically mature and then continue to ripen on the Tree. Other fruits, such as pears, are picked when mature, but before they ripen, then continue to ripen off the Tree. Citrus fruits pass from immaturity to maturity to overmaturity while still on the Tree. Once they are separated from the Tree, they do not increase in sweetness or continue to ripen. The only way change may happen after being picked is that they eventually start to decay.

With oranges, colour cannot be used as an indicator of ripeness because sometimes the rinds turn orange long before the oranges are ready to eat. Tasting them is the only way to know whether they are ready to eat.

Citrus Trees are not generally frost hardy. Mandarin oranges (C. reticulata) tend to be the hardiest of the common Citrus species and can withstand short periods down to as cold as −10 °C (14 °F), but realistically temperatures not falling below −2 °C (28 °F) are required for successful cultivation. Tangerines, tangors and yuzu can be grown outside even in regions with more marked subfreezing temperatures in winter, although this may affect fruit quality. A few hardy hybrids can withstand temperatures well below freezing, but do not produce quality fruit. Lemons can be commercially grown in cooler-summer/moderate-winter, coastal Southern California, because sweetness is neither attained nor expected in retail lemon fruit. The related trifoliate orange (C. trifoliata) can survive below −20 °C (−4 °F); its fruit are astringent and inedible unless cooked, but a few better-tasting cultivars and hybrids have been developed (see citranges).

## Leaf

The Trees thrive in a consistently sunny, humid environment with fertile soil and adequate rainfall or irrigation. Abandoned Trees in valleys may suffer, yet survive, the dry summer of Central California's Inner Coast Ranges. At any age, citrus grows well enough with infrequent irrigation in partial shade, but the fruit crop is smaller. Being of tropical and subtropical origin, oranges, like all citrus, are broadleaved and evergreen. They do not drop leaves except when stressed. The stems of many varieties have large sharp thorns. The Trees flower in the spring, and fruit is set shortly afterward. Fruit begins to ripen in fall or early winter, depending on cultivar, and develops increasing sweetness afterward. Some cultivars of tangerines ripen by winter. Some, such as the grapefruit, may take up to 18 months to ripen.

## Production

According to the UN Food and Agriculture Organization, world production of all citrus fruits in 2016 was 124 million tons, with about half of this production as oranges. According to the United Nations Conference on Trade and Development (UNCTAD), citrus production grew during the early 21st century mainly by the increase in cultivation areas, improvements in transportation and packaging, rising incomes and consumer preference for healthy foods. In 2019–20, world production of oranges was estimated to be 47.5 million tons, led by Brazil, Mexico, the European Union, and China as the largest producers.

## As ornamental plants

Citrus Trees grown in tubs and wintered under cover were a feature of Renaissance gardens, once glass-making technology enabled sufficient expanses of clear glass to be produced. An orangery was a feature of royal and aristocratic residences through the 17th and 18th centuries. The Orangerie at the Palace of the Louvre, 1617, inspired imitations that were not eclipsed until the development of the modern greenhouse in the 1840s. In the United States, the earliest surviving orangery is at the Tayloe House, Mount Airy, Virginia. George Washington had an orangery at Mount Vernon.

Some modern hobbyists still grow dwarf citrus in containers or greenhouses in areas where the weather is too cold to grow it outdoors. Consistent climate, sufficient sunlight, and proper watering are crucial if the Trees are to thrive and produce fruit. Compared to many of the usual "green shrubs", citrus Trees better tolerate poor container care. For cooler winter areas, limes and lemons should not be grown, since they are more sensitive to winter cold than other citrus fruits. Hybrids with kumquats (× Citrofortunella) have good cold resistance. A citrus Tree in a container may have to be repotted every 5 years or so, since the roots may form a thick "root-ball" on the bottom of the pot.

## Pests and diseases

Citrus canker is caused by the gammaproteobacterium Xanthomonas axonopodis

Citrus plants are very liable to infestation by aphids, whitefly, and scale insects (e.g. California red scale). Also rather important are the viral infections to which some of these ectoparasites serve as vectors such as the aphid-transmitted Citrus tristeza virus, which when unchecked by proper methods of control is devastating to citrine plantations. The newest threat to citrus groves in the United States is the Asian citrus psyllid.

The Asian citrus psyllid is an aphid-like insect that feeds on the leaves and stems of citrus Trees and other citrus-like plants. The real danger lies in the fact that the psyllid can carry a deadly, bacterial Tree disease called Huanglongbing (HLB), also known as citrus greening disease.

In August 2005, citrus greening disease was discovered in the south Florida region around Homestead and Florida City. The disease has since spread to every commercial citrus grove in Florida. In 2004–2005, USDA statistics reported the total Florida citrus production to be 169.1 million boxes of fruit. The estimate for all Florida citrus production in the 2015–2016 season is 94.2 million boxes, a 44.3% drop. Carolyn Slupsky, a professor of nutrition and food science at the University of California, Davis has said that "we could lose all fresh citrus within 10 to 15 years".

In June 2008, the psyllid was spotted dangerously close to California – right across the international border in Tijuana, Mexico. Only a few months later, it was detected in San Diego and Imperial Counties, and has since spread to Riverside, San Bernardino, Orange, Los Angeles and Ventura Counties, sparking quarantines in those areas. The Asian citrus psyllid has also been intercepted coming into California in packages of fruit and plants, including citrus, ornamentals, herbs and bouquets of cut flowers, shipped from other states and countries.

The foliage is also used as a food plant by the larvae of Lepidoptera (butterfly and moth) species such as the Geometridae common emerald (Hemithea aestivaria) and double-striped pug (Gymnoscelis rufifasciata), the Arctiidae giant leopard moth (Hypercompe scribonia), H. eridanus, H. icasia and H. indecisa, many species in the family Papilionidae (swallowtail butterflies), and the black-lyre leafroller moth ("Cnephasia" jactatana), a tortrix moth.

Since 2000, the citrus leafminer (Phyllocnistis citrella) has been a pest in California, boring meandering patterns through leaves.

In eastern Australia, the bronze-orange bug (Musgraveia sulciventris) can be a major pest of citrus Trees, particularly grapefruit. In heavy infestations it can cause flower and fruit drop and general Tree stress.

European brown snails (Cornu aspersum) can be a problem in California, though laying female Khaki Campbell and other mallard-related ducks can be used for control.

## Deficiency diseases

Citrus plants can also develop a deficiency condition called chlorosis, characterized by yellowing leaves highlighted by contrasting leaf veins. The shriveling leaves eventually fall, and if the plant loses too many, it will slowly die. This condition is often caused by an excessively high pH (alkaline soil), which prevents the plant from absorbing iron, magnesium, zinc, or other nutrients it needs to produce chlorophyll. This condition can be cured by adding an appropriate acidic fertilizer formulated for citrus, which can sometimes revive a plant to produce new leaves and even flower buds within a few weeks under optimum conditions. A soil which is too acidic can also cause problems; citrus prefers neutral soil (pH between 6 and 8). Citrus plants are also sensitive to excessive salt in the soil. Soil testing may be necessary to properly diagnose nutrient-deficiency diseases.

## Uses

### Culinary

Many citrus fruits, such as oranges, tangerines, grapefruits, and clementines, are generally eaten fresh.They are typically peeled and can be easily split into segments.Grapefruit is more commonly halved and eaten out of the skin with a spoon. Special spoons (grapefruit spoons) with serrated tips are designed for this purpose. Orange and grapefruit juices are also popular breakfast beverages. More acidic citrus, such as lemons and limes, are generally not eaten on their own. Meyer lemons can be eaten out of hand with the fragrant skin; they are both sweet and sour. Lemonade or limeade are popular beverages prepared by diluting the juices of these fruits and adding sugar. Lemons and limes are also used in cooked dishes, or sliced and used as garnishes. Their juice is used as an ingredient in a variety of dishes; it can commonly be found in salad dressings and squeezed over cooked fish, meat, or vegetables.

A variety of flavours can be derived from different parts and treatments of citrus fruits.The rind and oil of the fruit is generally bitter, especially when cooked, so is often combined with sugar. The fruit pulp can vary from sweet to extremely sour. Marmalade, a condiment derived from cooked orange and lemon, can be especially bitter, but is usually sweetened with sugar to cut the bitterness and produce a jam-like result. Lemon or lime is commonly used as a garnish for water, soft drinks, or cocktails. Citrus juices, rinds, or slices are used in a variety of mixed drinks. The colourful outer skin of some citrus fruits, known as zest, is used as flavouring in cooking; the white inner portion of the peel, the pith, is usually avoided due to its bitterness. The zest of a citrus fruit, typically lemon or an orange, can also be soaked in water in a coffee filter, and drunk.

Some Citrus species contain significant amounts of the phytochemical class called furanocoumarins, a diverse family of naturally occurring organic chemical compounds. In humans, some (not all) of these chemical compounds act as strong photosensitizers when applied topically to the skin, while other furanocoumarins interact with medications when taken orally. The latter is called the "grapefruit juice effect", a common name for a related group of grapefruit-drug interactions.

Due to the photosensitizing effects of certain furanocoumarins, some Citrus species are known to cause phytophotodermatitis, a potentially severe skin inflammation resulting from contact with a light-sensitizing botanical agent followed by exposure to ultraviolet light. In Citrus species, the primary photosensitizing agent appears to be bergapten, a linear furanocoumarin derived from psoralen. This claim has been confirmed for lime and bergamot. In particular, bergamot essential oil has a higher concentration of bergapten (3000–3600 mg/kg) than any other Citrus-based essential oil.

In general, three Citrus ancestral species (pomelos, citrons, and papedas) synthesize relatively high quantities of furanocoumarins, whereas a fourth ancestral species (mandarins) is practically devoid of these compounds. Since the production of furanocoumarins in plants is believed to be heritable, the descendants of mandarins (such as sweet oranges, tangerines, and other small mandarin hybrids) are expected to have low quantities of furanocoumarins, whereas other hybrids (such as limes, grapefruit, and sour oranges) are expected to have relatively high quantities of these compounds.

In most Citrus species, the peel contains a greater diversity and a higher concentration of furanocoumarins than the pulp of the same fruit. An exception is bergamottin, a furanocoumarin implicated in grapefruit-drug interactions, which is more concentrated in the pulp of certain varieties of pomelo, grapefruit, and sour orange.

One review of preliminary research on diets indicated that consuming citrus fruits was associated with a 10% reduction of risk for developing breast cancer.

### List of citrus fruits

- Grapefruit
- Citrons (Citrus medica) for sale in Germany
- Red finger Lime (Citrus australasica), a rare delicacy from Australia
- The genus Citrus has been suggested to originate in the eastern Himalayan foothills. Prior to human cultivation, it consisted of just a few species, though the status of some as distinct species has yet to be confirmed:
- Citrus crenatifolia – species name is unresolved, from Sri Lanka

  - Citrus japonica – kumquats, from East Asia ranging into Southeast Asia (sometimes separated into four-five Fortunella species)
  - Citrus mangshanensis – species name is unresolved, from Hunan, China
  - Citrus maxima – pomelo (pummelo, shaddock), from the Island Southeast Asia
  - Citrus medica – citron, from India
  - Citrus platymamma – byeonggyul, from Jeju Island, Korea
  - Citrus reticulata – mandarin orange, from China
  - Citrus trifoliata – trifoliate orange, from Korea and adjacent China (often separated as Poncirus)
  - Australian limes
- Citrus australasica – Australian finger lime
- Citrus australis – Australian round lime
- Citrus glauca – Australian desert lime
- Citrus garrawayi – Mount White lime
- Citrus gracilis – Kakadu lime or Humpty Doo lime
- Citrus inodora – Russel River lime and Maiden's Australian lime
- Citrus warburgiana – New Guinea wild lime
- Citrus wintersii – Brown River finger lime
  - Papedas, including
- Citrus halimii – limau kadangsa, limau kedut kera, from Thailand and Malaya
- Citrus hystrix – Kaffir lime, makrut, from Mainland Southeast Asia to Island Southeast Asia
- Citrus cavaleriei – Ichang papeda from southern China
- Citrus celebica – Celebes papeda
- Citrus indica – Indian wild orange, from the Indian subcontinent
- Citrus latipes – Khasi papeda, from Assam, Meghalaya, Burma
- Citrus longispina – Megacarpa papeda, winged lime, blacktwig lime
- Citrus macrophylla – Alemow
- Citrus macroptera – Melanesian papeda from Indochina to Melanesia
- Citrus micrantha, Citrus westeri – biasong or samuyao from the southern Philippines
- Citrus webberi – Kalpi, Malayan lemon

## Hybrids and cultivars

- Sweetie or oroblanco is a pomelo-grapefruit hybrid.
- The etrog, or citron, is central to the ritual of the Jewish Sukkot festival. Many varieties are used for this purpose (including the Yemenite variety pictured).
- Clementines (Citrus ×clementina) have thinner skins than oranges.
- Mikan (Citrus ×unshiu), also known as satsumas

- Sweet oranges (Citrus ×sinensis) are used in many foods. Their ancestors were pomelos and mandarin oranges.
- Cross-section of Odichukuthi lime
- Odichukuthi fruit
- A pompia fruit
- Sorted by parentage. As each hybrid is the product of (at least) two parent species, they are listed multiple times.
- Citrus maxima-based
    - Amanatsu, natsumikan – Citrus ×natsudaidai (C. maxima × unknown)
    - Cam sành – (C. reticulata × C. ×sinensis)
    - Dangyuja – (Citrus grandis Osbeck)
    - Grapefruit – Citrus ×paradisi (C. maxima × C. ×sinensis)
    - Haruka – Citrus tamurana x natsudaidai
    - Hassaku orange – (Citrus hassaku)
    - Ichang lemon – (Citrus wilsonii)
    - Imperial lemon – (C. ×limon × C. ×paradisi)
    - Kawachi Bankan – (Citrus kawachiensis)
    - Kinnow – (C. ×nobilis × C. ×deliciosa)
    - Kiyomi – (C. ×sinensis × C. ×unshiu)
    - Minneola tangelo – (C. reticulata × C. ×paradisi)
    - Orangelo, Chironja – (C. ×paradisi × C. ×sinensis)
    - Oroblanco, Sweetie – (C. maxima × C. ×paradisi)
    - Sweet orange – Citrus ×sinensis (probably C. maxima × C. reticulata)
    - Tangelo – Citrus ×tangelo (C. reticulata × C. maxima or C. ×paradisi)
    - Tangor – Citrus ×nobilis (C. reticulata × C. ×sinensis)
    - Ugli – (C. reticulata × C. maxima or C. ×paradisi)
- Citrus medica-based
    - Alemow, Colo – Citrus ×macrophylla (C. medica × C. micrantha)
    - Buddha's hand – Citrus medica var. sarcodactylus, a fingered citron.
    - Citron varieties with sour pulp – Diamante citron, Florentine citron, Greek citron and Balady citron
    - Citron varieties with sweet pulp – Corsican citron and Moroccan citron.
    - Etrog, a group of citron cultivars that are traditionally used for a Jewish ritual. Etrog is Hebrew for citron in general.
    - Fernandina – Citrus ×limonimedica (probably (C. medica × C. maxima) × C. medica)
    - Ponderosa lemon – (probably (C. medica × C. maxima) × C. medica)
    - Lemon – Citrus ×limon (C. medica × C. ×aurantium)
    - Key lime, Mexican lime, Omani lime – Citrus ×aurantiifolia (C. medica × C. micrantha)

  - Persian lime, Tahiti lime – C. ×latifolia (C. ×aurantiifolia × C. ×limon)
  - Limetta, Sweet Lemon, Sweet Lime, mosambi – Citrus ×limetta (C. medica × C. ×aurantium)
  - Lumia – several distinct pear shaped lemon-like hybrids
  - Pompia – Citrus medica tuberosa Risso & Poiteau, 1818 (C. medica × C. ×aurantium), native to Sardinia, genetically synonymous with Rhobs el Arsa.
  - Rhobs el Arsa – 'bread of the garden', C. medica × C. ×aurantium, from Morocco.
  - Yemenite citron – a pulpless true citron.
- Citrus reticulata–based
  - Bergamot orange – Citrus ×bergamia (C. ×limon × C. ×aurantium)
  - Bitter orange, Seville Orange – Citrus ×aurantium (C. maxima × C. reticulata)
  - Blood orange – Citrus ×sinensis cultivars
  - Calamansi, Calamondin – (Citrus reticulata × Citrus japonica)
  - Cam sành – (C. reticulata × C. ×sinensis)
  - Chinotto – Citrus ×aurantium var. myrtifolia or Citrus ×myrtifolia
  - ChungGyun – Citrus reticulata cultivar[verification needed]
  - Clementine – Citrus ×clementina
  - Cleopatra Mandarin – Citrus ×reshni
  - Siranui – Citrus reticulata cv. 'Dekopon' (ChungGyun × Ponkan)
  - Daidai – Citrus ×aurantium var. daidai or Citrus ×daidai
  - Encore – ((Citrus reticulata x sinensis) x C. deliciosa)
  - Grapefruit – Citrus ×paradisi (C. maxima × C. ×sinensis)
  - Hermandina – Citrus reticulata cv. 'Hermandina'
  - Imperial lemon – ((C. maxima × C. medica) × C. ×paradisi)
  - Iyokan, anadomikan – Citrus ×iyo
  - Jabara – (Citrus jabara)
  - Murcott – (C. reticulata x sinensis)
  - Naartjie – (C. reticulata × C. nobilis)
  - Nova mandarin, Clemenvilla
  - Orangelo, Chironja – (C. ×paradisi × C. ×sinensis)
  - Oroblanco, Sweetie – (C. maxima × C. ×paradisi)
  - Palestine sweet lime [fr] – Citrus ×limettioides Tanaka (C. medica × C. ×sinensis)
  - Ponkan – Citrus reticulata cv. 'Ponkan'
  - Rangpur, Lemanderin, Mandarin Lime – Citrus ×limonia (C. reticulata × C. medica)
  - Reikou – (Kuchinotsu No.37 x 'Murcott')
  - Rough lemon – Citrus ×jambhiri Lush. (C. reticulata × C. medica)
  - Sanbokan – Citrus sulcata

  - Setoka – (Kuchinotsu No.37 x 'Murcott')
  - Shekwasha, Hirami Lemon, Taiwan Tangerine – Citrus ×depressa
  - Sunki, Suenkat – Citrus sunki or C. reticulata var. sunki
  - Sweet orange – Citrus ×sinensis (C. maxima × C. reticulata)
  - Tachibana orange – Citrus tachibana (Mak.) Tanaka or C. reticulata var. tachibana
  - Yuzu – Citrus ×junos (C. reticulata × C. ×cavaleriei)
- Other/Unresolved
  - Djeruk limau – Citrus ×amblycarpa
  - Gajanimma, Carabao Lime – Citrus ×pennivesiculata
  - Hyuganatsu, Hyuganatsu pumelo – Citrus tamurana
  - Ichang lemon – (C. cavaleriei × C. maxima)
  - Kabosu – Citrus ×sphaerocarpa
  - Odichukuthi – Citrus Odichukuthi from Malayalam
  - Ougonkan – Citrus flaviculpus hort ex. Tanaka
- For hybrids with kumquats, see citrofortunella. For hybrids with the trifoliate orange, see citrange.

**Source**

*https://en.wikipedia.org/wiki/Citrus*

## 6. *Ficus benghalensis* (మర్రి, Marri, Banyan)

**Classification**

Kingdom: Plantae
Clade: Tracheophytes
Clade: Angiosperms
Clade: Eudicots
Clade: Rosids
Order: Rosales
Family: Moraceae
Genus: Ficus
Subgenus: F. subg. Urostigma
Species: F. benghalensis

Binomial name
Ficus benghalensis
L. 1753

Synonyms
Ficus banyana Oken
Ficus benghalensis var. krishnae (C. D. C.) Corner
Ficus chauvieri G. Nicholson
Ficus cotoneifolia Vahl
Ficus cotonifolia Stokes
Ficus crassinervia Kunth & C. D. Bouché
Ficus karet Baill.
Ficus krishnae C. D. C.
Ficus lancifolia Moench
Ficus lasiophylla Link
Ficus procera Salisb.
Ficus pubescens B. Heyne ex Roth
Ficus umbrosa Salisb.
Perula benghalensis Raf.
Urostigma benghalense (L.) Gasp.
Urostigma crassirameum Miq.
Urostigma procerum Miq.
Urostigma pseudorubrum Miq.
Urostigma rubescens Miq.
Urostigma sundaicum Miq.
Urostigma tjiela Miq.

## Introduction

Ficus benghalensis, commonly known as the banyan, banyan fig and Indian banyan, is a Tree native to the Indian Subcontinent. Specimens in India are among the largest Trees in the world by canopy coverage.

## Ecology

Ficus benghalensis produces propagating roots which grow downwards as aerial roots. Once these roots reach the ground they grow into woody trunks.

The figs produced by the Tree are eaten by birds such as the Indian myna. Fig seeds that pass through the digestive system of birds are more likely to germinate and sprout earlier.

## Cultural significance

The Tree is considered sacred in India, and temples are often built nearby. Due to the large size of the Tree's canopy, it provides useful shade in hot climates.

In Theravada Buddhism, this Tree is said to have been used as the Tree for achieved enlightenment, or Bodhi by the twenty fourth Buddha called "Kassapa - කස්සප". The sacred plant is known as "Nuga - නුග" or "Maha nuga - මහ නුග" in Sri Lanka.

It is the Tree under which Lord Adhinath the first Jain Tirthankara attained Kewal Gyan or spiritual enlightenment.

The giant banyans of India are the largest Trees in the world by area of canopy coverage. Notable Trees include:

- Thimmamma Marrimanu
- Kabirvad
- The Great Banyan

The largest, known specimen of Tree in the world in terms of the two dimensional area covered by its canopy is Thimmamma Marrimanu in Andhra Pradesh, India, which covers 19,107 square metres (205,670 sq ft). This Tree is also the largest, known specimen of Tree in the world in terms of the length of its perimeter, which measures 846 metres (2,776 ft).

Nearchus, an admiral of Alexander the Great, described a large specimen on the banks of the Narmada River in contemporary Bharuch, Gujarat, India; he may have described the specimen presently named "Kabirvad". The canopy of the specimen which Nearchus described was so extensive that it sheltered 7,000 men. James Forbes later described it in his Oriental Memoirs (1813-5) as almost 610 m (2,000 ft) in circumference and having more than 3,000 trunks. Currently the area of its canopy is 17,520 square metres (188,600 sq ft) with a perimeter of 641 metres (2,103 ft).

Other notable Indian specimens include The Great Banyan in the Jagadish Chandra Bose Botanic Garden in Shibpur, Howrah, which has a canopy area of 18,918 square metres (203,630 sq ft) and is about 250 years old, and Dodda Aladha Mara in Kettohalli, Karnataka, which has a canopy area of 12,000 square metres (130,000 sq ft) and is about 400 years old.

**Source**

*https://en.wikipedia.org/wiki/Ficus_benghalensis*

## 7. *Ficus religiosa* (Sacred fig, రావి చెట్టు, Raavi)

**Classification**

Kingdom: Plantae
Clade: Tracheophytes
Clade: Angiosperms
Clade: Eudicots
Clade: Rosids
Order: Rosales
Family: Moraceae
Genus: Ficus
Species: F. religiosa

Binomial name

Ficus religiosa
L. 1753 not Forssk. 1775

Synonyms

Ficus caudata Stokes
Ficus peepul Griff.
Ficus religiosa var. cordata Miq.
Ficus religiosa var. rhynchophylla Miq.
Ficus rhynchophylla Steud.

## Introduction

Ficus religiosa or sacred fig is a species of fig native to the Indian subcontinent and Indochina that belongs to Moraceae, the fig or mulberry family. It is also known as the bodhi Tree, pippala Tree, peepul Tree, peepal Tree, pipal Tree, or ashwattha Tree (in India and Nepal). The sacred fig is considered to have a religious significance in three major religions that originated on the Indian subcontinent, Hinduism, Buddhism and Jainism. Hindu and Jain ascetics consider the Tree to be sacred and often mate under them. This is the Tree under which Gautama Buddha is believed to have attained enlightenment. The sacred fig is the state Tree of the Indian states of Odisha and Haryana.

## Description

Ficus religiosa is a large dry season-deciduous or semi-evergreen Tree up to 30 metres (98 ft) tall and with a trunk diameter of up to 3 metres (9.8 ft). The leaves are cordate in shape with a distinctive extended drip tip; they are 10–17 centimetres (3.9–6.7 in) long and 8–12 centimetres (3.1–4.7 in) broad, with a 6–10 centimetres (2.4–3.9 in) petiole. The fruits are small figs 1–1.5 centimetres (0.39–0.59 in) in diameter, green ripening to purple.

F. religiosa has a very long lifespan, ranging on average between 900 and 1,500 years. In some of its native habitats, it has been reportedly found living for over 3,000 years. Some Trees have been reported to be more than 2,000 years old, like the Jaya Sri Maha Bodhi, a peepal Tree in the ancient city of Anuradhapura in Sri Lanka which is estimated to be more than 2,250 years old and is regarded as the "Oldest historical Tree in the world with religious importance".

## Distribution

Ficus religiosa is native to most of the Indian subcontinent – Bangladesh, Nepal, Pakistan and India including the Assam region, Eastern Himalaya and the Nicobar Islands, as well as part of Indochina – the Andaman Islands, Thailand, Myanmar and Peninsular Malaysia. It has been widely introduced elsewhere, particularly in the rest of tropical Asia, but also in Iran, Florida and Venezuela.

## Ecology

Ficus religiosa suitably grows at altitudes ranging from 10 metres (33 ft) up to 1,520 metres (4,990 ft). Due to the climatic conditions which are prevalent throughout different heat zones, it can grow at latitudes ranging from 30°N to 5°S. It can tolerate air temperatures ranging between 0 °C (32 °F) to 35 °C (95 °F), beyond this upper limit its growth diminishes. It grows on a wide variety of soils but preferably needs deep, alluvial sandy loam with good drainage. It is also found on shallow soils including rock crevices.

## Association

Ficus religiosa is associated with Blastophaga quadriceps, an agaonid wasp which acts as its pollinator as this wasp lays its eggs only on Trees of this species.

## Environment

Ficus religiosa is tolerant to various climate zones (Köppen climate classification categories of Af, Am, Aw/As, Cfa, Cwa and Csa) and various types of soils. In Paraguay the Tree species occurs in forests at lower elevations, and in China the species has been reported growing at altitudes ranging from 400 metres (1,300 ft) to 700 metres (2,300 ft). In India, being a native species, it occurs both naturally in wild as well as cultivated up to altitudes of 1,520 metres (4,990 ft).

## Climate

Ficus religiosa is tolerant to widely varying climatic conditions such as Tropical rainforest climate where the region receives more than 60 millimetres (6.0 cm) of precipitation per month, Tropical monsoon climate where average precipitation ranges from 60 millimetres (6.0 cm) in the driest month to 100 millimetres (10 cm), Tropical savanna climate with dry summer where average precipitation ranges from 60 millimetres (6.0 cm) per month in summers to 100 millimetres (10 cm) per month in winters, Warm temperate climate, wet all year where average temperature ranges from 0 °C (32 °F) to 10 °C (50 °F) and it is wet all year, as well as Warm temperate climate with dry summer where average temperature ranges from 0 °C (32 °F) to 10 °C (50 °F) and summers are dry.

## Invasiveness

Unlike most epiphytic jungle figs, which ring the stems of dicotyledonous support Trees from the outside, the epiphytic bushes of F. religiosa are not true stranglers. Their roots penetrate inside the stem of the support, eventually splitting it from within. Ficus religiosa has been listed as an "environmental weed" or "naturalised weed" by the Global Compendium of Weeds (Randall, 2012). It has been assigned an invasiveness high risk score of 7 in a risk assessment prepared for the species' invasiveness in Hawaii by PIER. Such a high score predicts it will become a major pest in suitable climate zones. The major reasons for its invasive behaviour are its fast-growing nature, tolerance to various climate zones and soil types, reported lifespan of over 3,000 years, and its suffocating growth habit as it often begins life as an epiphyte.

## Religious Importance

The Ficus religiosa Tree is considered sacred by the followers of Hinduism, Jainism and Buddhism. In the Bhagavad Gita, Krishna says, "I am the Peepal Tree among the Trees, Narada among the sages, Chitraaratha among the Gandharvas, And sage Kapila among the Siddhas."

## Buddhism

Gautama Buddha attained enlightenment (bodhi) while mating underneath a Ficus religiosa. The site is in present-day Bodh Gaya in Bihar, India. The original Tree was destroyed, and has been replaced several times. A branch of the original Tree was rooted in Anuradhapura, Sri Lanka in 288 BCE and is known as Jaya Sri Maha Bodhi; it is the oldest living human-planted flowering plant (angiosperm) in the world.

The Bodhi Tree at the Mahabodhi Temple was propagated from the Sri Maha Bodhi, which in turn was propagated from the original Bodhi Tree at this location.

In Theravada Buddhist Southeast Asia, the Tree's massive trunk is often the site of Buddhist or animist shrines. Not all Ficus religiosa can be called a Bodhi Tree. A Bodhi Tree must be able to trace its parent to another Bodhi Tree and the line goes on until the first Bodhi Tree under which Gautama is said to have gained enlightenment.

## Hinduism

Sadhus (Hindu ascetics) still mate beneath sacred fig Trees, and Hindus do pradakshina (circumambulation, or mative pacing) around the sacred fig Tree as a mark of worship. Usually seven pradakshinas are done around the Tree in the morning time chanting "vriksha rajaya namah", meaning "salutation to the king of Trees". It claimed that the 27 stars (constellations) constituting 12 houses (rasis) and 9 planets are specifically represented precisely by 27 Trees—one for each star. The Bodhi Tree is said to represent Pushya (Western star name γ, δ and θ Cancri in the Cancer constellation).

Plaksa is a possible Sanskrit term for Ficus religiosa. However, according to Macdonell and Keith (1912), it denotes the wavy-leaved fig Tree (Ficus infectoria) instead. In Hindu texts, the Plaksa Tree is associated with the source of the Sarasvati River. The Skanda Purana states that the Sarasvati originates from the water pot of Brahma flows from Plaksa on the Himalayas. According to Vamana Purana 32.1-4, the Sarasvati was rising from the Plaksa Tree (Pipal Tree). Plaksa Pra-sravana denotes the place where the Sarasvati appears. In the Rigveda Sutras, Plaksa Pra-sravana refers to the source of the Sarasvati.

## Cultivation

Ficus religiosa is grown by specialty Tree plant nurseries for use as an ornamental Tree, in gardens and parks in tropical and subtropical climates. Peepul Trees are native to Indian subcontinent and thrive in hot, humid weather. They prefer full sunlight and can grow in all soil types, though loam is the best. When planting, use soil with a pH of 7 or below. While it is possible for the plant to grow indoors in a pot, it grows best outside. Young peepul needs proper nourishment. It requires full sunlight and proper watering. Sacred fig occurs naturally in submontane forest regions. As with many Ficus Trees, these are well suited for Bonsai training.

In the Middle East, it is preferably planted as an avenue or road verge Tree. In the Philippines and in Nicaragua the species is cultivated in parks and along roadsides and pavements, while in Paraguay it occurs in forests at lower elevations.

In Thailand โพ or "Pho" Trees grow everywhere, but in the Wats (temples) they are revered, and usually are several hundred years old, with trunks up to 20 feet / 6 meters wide. As with all sacred Trees in Thailand, they have a saffron cloth wrapped around the base. A yearly ritual involving the Bo Trees at wats is the purchasing of "mai kam sii" ไม้ค้ำศรี, which are "supports" that look like crutches and are placed under the spreading branches as if holding them up. The purchase money helps fund the wat, a central part of Thai life.

## Uses

Ficus religiosa is used in traditional medicine for about fifty types of disorders including asthma, diabetes, diarrhea, epilepsy, gastric problems, inflammatory disorders, infectious and sexual disorders.

Prayer beads are made from the seeds of Ficus religiosa, considered sacred because of the closeness to Buddha himself and his enlightenment.

Farmers in North India also cultivate it for its fig fruit.

The trunk of this Tree is used by farmers as a soil leveller. After seed harvesting, the rectangular shaped trunk is connected to tractors and levels the soil.

## Source

*https://en.wikipedia.org/wiki/Ficus_religiosa*

## 8. *Aloe vera* (కలబంద, Aloes)

**Classification**

Kingdom: Plantae
Clade: Tracheophytes
Clade: Angiosperms
Clade: Monocots
Order: Asparagales
Family: Asphodelaceae
Subfamily: Asphodeloideae

Genus: Aloe
Species: A. vera

Binomial name
Aloe vera
(L.) Burm.f.

Synonyms

- Aloe barbadensis Mill.

Aloe barbadensis var. chinensis Haw.
Aloe chinensis (Haw.) Baker
Aloe elongata Murray
Aloe flava Pers.
Aloe indica Royle
Aloe lanzae Tod.
Aloe maculata Forssk. (illegitimate)
Aloe perfoliata var. vera L.
Aloe rubescens DC.
Aloe variegata Forssk. (illegitimate)
Aloe vera Mill. (illegitimate)
Aloe vera var. chinensis (Haw.) A. Berger
Aloe vera var. lanzae Baker
Aloe vera var. littoralis J.Koenig ex Baker
Aloe vulgaris Lam.

### Introduction

Aloe vera (/ˈæloʊiː/ or /ˈæloʊ/) is a succulent plant species of the genus Aloe. Having some 500 species, Aloe is widely distributed, and is considered an invasive species in many world regions.

An evergreen perennial, it originates from the Arabian Peninsula, but grows wild in tropical, semi-tropical, and arid climates around the world. It is cultivated for commercial products, mainly as a topical treatment used over centuries. The species is attractive for decorative purposes, and succeeds indoors as a potted plant.

It is used in many consumer products, including beverages, skin lotion, cosmetics, ointments or in the form of gel for minor burns and sunburns. There is little clinical evidence for the effectiveness or safety of Aloe vera extract as a cosmetic or topical drug. The name derives from Latin as aloe and vera ("true").

## Etymology and common names

The botanical name derives from Latin, aloe (also from Greek), having uncertain origin, and vera ("true") from Latin. Common names use aloe with a region of its distribution, such as Chinese aloe, Cape aloe or Barbados aloe.

## Description

Aloe vera is a stemless or very short-stemmed plant growing to 60–100 centimetres (24–39 inches) tall, spreading by offsets. The leaves are thick and fleshy, green to grey-green, with some varieties showing white flecks on their upper and lower stem surfaces. The margin of the leaf is serrated and has small white teeth. The flowers are produced in summer on a spike up to 90 cm (35 in) tall, each flower being pendulous, with a yellow tubular corolla 2–3 cm (3⁄4–1+1⁄4 in) long. Like other Aloe species, Aloe vera forms arbuscular mycorrhiza, a symbiosis that allows the plant better access to mineral nutrients in soil.

Aloe vera leaves contain phytochemicals under study for possible bioactivity, such as acetylated mannans, polymannans, anthraquinone C-glycosides, anthrones, and other anthraquinones, such as emodin and various lectins.

## Taxonomy

The species has several synonyms: A. barbadensis Mill., Aloe indica Royle, Aloe perfoliata L. var. vera and A. vulgaris Lam. Some literature identifies the white-spotted form of Aloe vera as Aloe vera var. chinensis; and the spotted form of Aloe vera may be conspecific with A. massawana. The species was first described by Carl Linnaeus in 1753 as Aloe perfoliata var. vera,[20] and was described again in 1768 by Nicolaas Laurens Burman as Aloe vera in Flora Indica on 6 April and by Philip Miller as Aloe barbadensis some ten days after Burman in the Gardener's Dictionary.

Techniques based on DNA comparison suggest Aloe vera is relatively closely related to Aloe perryi, a species endemic to Yemen.Similar techniques, using chloroplast DNA sequence comparison and ISSR profiling have also suggested it is closely related to Aloe forbesii, Aloe inermis, Aloe scobinifolia, Aloe sinkatana, and Aloe striata.With the exception of the South African species A. striata, these Aloe species are native to Socotra (Yemen), Somalia, and Sudan.The lack of obvious natural populations of the species has led some authors to suggest Aloe vera may be of hybrid origin.

## Distribution

A. vera is considered to be native only to the south-eastArabian Peninsula in the Al-Hajar mountains in north-eastern Oman.However, it has been widely cultivated around the world, and has become naturalized in North Africa, as well as Sudan and neighboring countries, along with the Canary Islands, Cape Verde, and Madeira Islands. It has also naturalized in the Algarve region of Portugal and in wild areas across southern Spain, especially in the region of Murcia.

The species was introduced to China and various parts of southern Europe in the 17th century. It is widely naturalized elsewhere, occurring in arid, temperate, and tropical regions of temperate continents. The current distribution may be the result of cultivation.

## Cultivation

## As an ornamental plant

Aloe vera has been widely grown as an ornamental plant. The species is popular with modern gardeners as a topical medicinal plant and for its interesting flowers, form, and succulence. This succulence enables the species to survive in areas of low natural rainfall, making it ideal for rockeries and other low water-use gardens. The species is hardy in zones 8–11, and is intolerant of heavy frost and snow. The species is relatively resistant to most insect pests, though spider mites, mealy bugs, scale insects, and aphid species may cause a decline in plant health. This plant has gained the Royal Horticultural Society's Award of Garden Merit.

In pots, the species requires well-drained, sandy potting soil and bright, sunny conditions. Aloe plants can turn red from sunburn under too much direct sun, though gradual acclimation may help. The use of a good-quality commercial propagation mix or packaged "cacti and succulent mix" is recommended, as they allow good drainage. Terra cotta pots are preferable as they are porous. Potted plants should be allowed to completely dry before rewatering. When potted, aloes can become crowded with "pups" growing from the sides of the "mother plant". Plants that have become crowded can be divided and repotted to allow room for further growth, or the pups can be left with the mother plant. During winter, Aloe vera may become dormant, during which little moisture is required. In areas that receive frost or snow, the species is best kept indoors or in heated glasshouses. Houseplants requiring similar care include haworthia and agave.

There is large-scale agricultural production of Aloe vera in Australia, Cuba, the Dominican Republic, China, Mexico, India, Jamaica, and Spain, where it grows even well inland, Kenya, Tanzania, and South Africa, along with the USA to supply the cosmetics industry.

## Uses

Two substances from Aloe vera – a clear gel and its yellow latex – are used to manufacture commercial products. Aloe gel typically is used to make topical medications for skin conditions, such as burns, wounds, frostbite, rashes, psoriasis, cold sores, or dry skin. Aloe latex is used individually or manufactured as a product with other ingredients to be ingested for relief of constipation. Aloe latex may be obtained in a dried form called resin or as "aloe dried juice".

## Research

There is conflicting evidence regarding whether Aloe vera is effective as a treatment for wounds or burns. There is some evidence that topical use of aloe products might relieve symptoms of certain skin disorders, such as psoriasis, acne, or rashes.

Aloe vera gel is used commercially as an ingredient in yogurts, beverages, and some desserts, but at high or prolonged doses, ingesting aloe latex or whole leaf extract can be toxic. Use of topical aloe vera in small amounts is likely to be safe.

## Topical medication and potential side effects

Aloe vera may be prepared as a lotion, gel, soap or cosmetics product for use on skin as a topical medication. For people with allergies to Aloe vera, skin reactions may include contact dermatitis with mild redness and itching, difficulty with breathing, or swelling of the face, lips, tongue, or throat.

## Dietary supplement

Aloin, a compound found in the semi-liquid latex of some Aloe species, was the common ingredient in over-the-counter (OTC) laxative products in the United States until 2002 when the Food and Drug Administration banned it because manufacturers failed to provide the necessary safety data. Aloe vera has potential toxicity, with side effects occurring at some dose levels both when ingested and when applied topically. Although toxicity may be less when aloin is removed by processing, Aloe vera ingested in high amounts may induce side effects, such as abdominal pain, diarrhea or hepatitis. Chronic ingestion of aloe (dose of 1 gram per day) may cause adverse effects, including hematuria, weight loss, and cardiac or kidney disorders.

Aloe vera juice is marketed to support the health of the digestive system, but there is neither scientific evidence nor regulatory approval for this claim. The extracts and quantities typically used for such purposes are associated with toxicity in a dose-dependent way.

## Traditional medicine

Aloe vera is used in traditional medicine as a skin treatment. Early records of its use appear from the fourth millennium BCE. It is also written of in the Juliana Anicia Codex of 512 CE.:9

## Commodities

Aloe vera is used on facial tissues where it is promoted as a moisturizer and anti-irritant to reduce chafing of the nose. Cosmetic companies commonly add sap or other derivatives from Aloe vera to products such as makeup, tissues, moisturizers, soaps, sunscreens, incense, shaving cream, or shampoos. A review of academic literature notes that its inclusion in many hygiene products is due to its "moisturizing emollient effect".

## Toxicity

Orally ingested non-decolorized aloe vera leaf extract was listed by the California Office of Environmental Health Hazard Assessment, along with goldenseal, among "chemicals known to the state to cause cancer or reproductive toxicity".

Use of topical aloe vera is not associated with significant side effects. Oral ingestion of aloe vera is potentially toxic, and may cause abdominal cramps and diarrhea which in turn can decrease the absorption of drugs.

## Interactions with prescribed drugs

Ingested aloe products may have adverse interactions with prescription drugs, such as those used to treat blood clots, diabetes, heart disease and potassium-lowering agents (such as Digoxin), and diuretics, among others.

**Source**

*https://en.wikipedia.org/wiki/Aloe_vera*

## 9. ***Senegalia rugata*** **(Shikakai, శీకాయ)**

**Classification**

Kingdom: Plantae
Clade: Tracheophytes
Clade: Angiosperms
Clade: Eudicots
Clade: Rosids
Order: Fabales
Family: Fabaceae
Clade: Mimosoideae
Genus: Senegalia
Species: S. rugata

Binomial name

Senegalia rugata
(Lam.) Britton & Rose

Synonyms

Acacia abstergens (Roxb. ex Spreng.) Steud.
Acacia concinna (Willd.) DC.
Acacia gamblei Bahadur & R.C.Gaur
Acacia habbasioides Bojer
Acacia hooperiana Zipp. ex Miq.
Acacia philippinarum Benth.
Acacia poilanei Gagnep.
Acacia polycephala DC.
Acacia quisumbingii Merr.
Acacia rugata (Lam.) Buch.-Ham. ex Voigt
Acacia rugata Buch.-Ham. ex Benth.
- Acacia sinuata (Lour.) Merr.

Arthrosprion stipulatum Hassk.
Mimosa abstergens Roxb. ex Spreng.
Mimosa concinna Willd.
Mimosa rugata Lam.
Mimosa saponaria Roxb. ex Wight & Arn.
Mimosa sinuata Lour.
Mimosa tenuifolia Blanco

## Introduction

Senegalia rugata, commonly known in India as Shikakai, is a spiny climbing shrub native to China and tropical Asia, common in the warm plains of central and south India. It is renowned as a raw material for shampoo, while the leaves and young shoots are often eaten. Archaeobotanical evidence shows its use for hair care in the pre-Harrapan levels of Banawali, some 4500–4300 years ago.

## Description

Senegalia rugata is a woody climber, or shrub, or small Tree up to 5 metres (16 ft) tall, with numerous spines. Leaves are bipinnate. Cream to pale-yellow flowers, though buds are red to purplish-red and when the flowers are open they appear cream. The seed pods are distinctive, when fresh they are smooth, thick and fleshy however when they dry they become wrinkled, blackish and very hard.

## Distribution

The species is native to Asia, including Zhōngguó/China. Countries and regions to which it is native include: Papua Niugini (Eastern New Guinea); Indonesia (West Papua, Kai Islands, Sulawesi, Nusa Tenggara, Maluku, Jawa, Sumatera); Philippines; Malaysia (Peninsular Malaysia); Thailand; Cambodia; Vietnam; Zhōngguó/China (Guangdong, Yunnan); Laos; Myanmar; India (Andaman Islands, Assam, Bangladesh, Nepal, East Himalaya. It has been introduced/naturalized to the following countries/regions: Nouvelle Caledonie; Australia (Queensland); Japan (Okinawa); Réunion; Madagascar; Seychelles; Brazil (southeast); Jamaica

## Habitat and ecology

In the Philippines the plant occurs in low and medium elevation thickets. The species grows both in the forest and within villages in Chiang Mai Province, Thailand. S. rugata grows in forest or thickets in Zhōngguó/China, most commonly near watercourses in valleys, at an altitude of between 880 and 1,500 metres (2,890 and 4,920 ft).

## Archaeobotany

Pre-Harappan level of Banawali (2750–2500 BC), Haryana have revealed traces of a mixture of Shikakai with soap nuts and Amla (Indian Gooseberry), exhibiting ancient roots of South Asian hygiene.

Vernacular names

- Khmer: ba:y dâmnaëb ('sticky rice', an allusion to its clingy thorns), bânla sâöt ('viscous spines'), sâmpöy, sândaèk kâmpöënh (evoking 'wild bean')

- Thai: **ส้มขน** som khon or **ส้มป่อย** som poi

- Karen (Pang Hin Fon district): phu che sa or pa chi  (Chiang Mai Province, Thailand)
- Lawa language, Pang Hin Fon district, Chiang Mai, Thailand: kad ka ha[what language is this?]
- Chinese: 紫荚金合欢; pinyin: zǐ jiá jīn hé huān; lit. 'purple-pod senegalia'
- Australian English: soap pod wattle

## Uses

### Shikakai, hair care

Senegalia rugata has been used traditionally for hair care in the Indian Subcontinent since ancient times. It is one of the Ayurvedic medicinal plants. It is traditionally used as a shampoo and it is also added in synthetic Ayurvedic shampoos. It is widely known as Shikakai.(in language tamil) In order to prepare it, the fruit pods, leaves and bark of the plant are dried, ground into a powder, then made into a paste. While this traditional shampoo does not produce the normal amount of lather that a sulfate-containing shampoo would, it is considered a good cleanser. It is mild, having a naturally low pH, and does not strip hair of natural oils. An infusion of the leaves has been used in anti-dandruff preparations.

Senagalia rugata extracts are used in natural shampoos or hair powders and the Tree is now grown commercially in India and Far East Asia. The plant parts used for the dry powder or the extract are the bark, leaves or pods. The bark contains high levels of saponins, which foaming agents are found in several other plant species used as shampoos or soaps. Saponin-containing plants have a long history of use as mild cleaning agents. Saponins from the plant's pods have been traditionally used as a detergent, and in Bengal for poisoning fish; they are documented to be potent marine toxins.

### Food, medicine, and other uses

This species is used in a variety of ways in Cambodia. The young leaves are included in salads. The fruit is used for washing hair and in local medicine. To treat abscesses, eczema and leprosy the fruit can also be used externally or as a laxative when they are taken internally. The pulp of the fruit, without the seeds, is used as a diuretic and emetic, while the seeds are reputed to make delivery in childbirth easier.

Traditional healers of Nakhon Nayok Province, Thailand, use the leaves of this species to treat irregular menstruation.

Amongst the Karen people of Chiang Mai Province, Thailand, the plant is one of the most widely used legumes. They use the fruit in a cold infusion both as soap and shampoo, and as a medicine for food poisoning. The dried fruit is used in holy water for the rituals to pay respect to elderly people and to evict wickedness.

Investigating plant use amongst both Karen and Lawa people living in Pang Hin Fon district (Chiang Mai), S. rugata was one of the plants that provided both food and health-products. The young shoots and leaves are cooked in a soup, the fruit are eaten raw or cooked, while the bark was chewed and kept as a quid in the mouth to counter-act toothache, and a decoction of the fruit was used as shampoo.

An infusion of the leaves of Senagalia rugata has also been used for therapy of jaundice in the traditional Indian medicine.

In Nepal, the plant is one of many that are processed and sold in the medicinal products industry. In 2004, an estimated 2,459 kilograms (5,421 lb) of material was purchased nationwide by the industry at an average price of 80 Nepalese rupees. Central wholesalers provided the raw material.

## Flowers

The leaves have an acidic taste and are used in chutneys.

## Chemical constituents

Alkaloids are found in the Tree's fruit.In commercial extracts, when the plant is hydrolyzed it yields lupeol, spinasterol, acacic acid, lactone, and the natural sugars glucose, arabinose and rhamnose. It also contains hexacosanol, spinasterone, oxalic acid, tartaric acid, citric acid, succinic acid, ascorbic acid, and the alkaloids calyctomine and nicotine.

## Source

*https://en.wikipedia.org/wiki/Senegalia_rugata*

## 10.*Curcuma longa* (పసుపు, Turmeric)

**Classification**

Kingdom: Plantae
Clade: Tracheophytes
Clade: Angiosperms
Clade: Monocots
Clade: Commelinids
Order: Zingiberales
Family: Zingiberaceae
Genus: Curcuma
Species: C. longa

Binomial name

Curcuma longa
L.

Synonyms

Curcuma domestica Valeton

## Introduction

Turmeric (pronounced /ˈtɜːrmərɪk/, also /ˈtjuːmərɪk/) is a flowering plant, Curcuma longa of the ginger family, Zingiberaceae, the rhizomes of which are used in cooking. The plant is a perennial, rhizomatous, herbaceous plant native to the Indian subcontinent and Southeast Asia, that requires temperatures between 20 and 30 °C (68 and 86 °F) and a considerable amount of annual rainfall to thrive. Plants are gathered each year for their rhizomes, some for propagation in the following season and some for consumption.

The rhizomes are used fresh or boiled in water and dried, after which they are ground into a deep orange-yellow powder commonly used as a coloring and flavoring agent in many Asian cuisines, especially for curries, as well as for dyeing, characteristics imparted by the principal turmeric constituent, curcumin.

Turmeric powder has a warm, bitter, black pepper–like flavor and earthy, mustard-like aroma.

Curcumin, a bright yellow chemical produced by the turmeric plant, is approved as a food additive by the World Health Organization, European Parliament, and United States Food and Drug Administration.

Although long used in Ayurvedic medicine, where it is also known as haridra, there is no high-quality clinical evidence for using turmeric or curcumin to treat any disease.

## Origin and distribution

The greatest diversity of Curcuma species by number alone is in India, at around 40 to 45 species. Thailand has a comparable 30 to 40 species. Other countries in tropical Asia also have numerous wild species of Curcuma. Recent studies have also shown that the taxonomy of Curcuma longa is problematic, with only the specimens from South India being identifiable as C. longa. The phylogeny, relationships, intraspecific and interspecific variation, and even identity of other species and cultivars in other parts of the world still need to be established and validated. Various species currently utilized and sold as "turmeric" in other parts of Asia have been shown to belong to several physically similar taxa, with overlapping local names.

## History

Turmeric has been used in Asia for centuries and is a major part of Ayurveda, Siddha medicine, traditional Chinese medicine, Unani, and the animistic rituals of Austronesian peoples. It was first used as a dye, and then later for its supposed properties in folk medicine.

From India, it spread to Southeast Asia along with Hinduism and Buddhism, as the yellow dye is used to color the robes of monks and priests. Turmeric has also been found in Tahiti, Hawaii and Easter Island before European contact. There is linguistic and circumstantial evidence of the spread and use of turmeric by the Austronesian peoples into Oceania and Madagascar. The populations in Polynesia and Micronesia, in particular, never came into contact with India, but use turmeric widely for both food and dye. Thus independent domestication events are also likely.

Turmeric was found in Farmana, dating to between 2600 and 2200 BCE, and in a merchant's tomb in Megiddo, Israel dating from the second millennium BCE. It was noted as a dye plant in the Assyrians Cuneiform medical texts from Ashurbanipal’s library at Nineveh from 7th century BCE. In Medieval Europe, turmeric was called "Indian saffron."

## Etymology

The name possibly derives from Middle English or Early Modern English as turmeryte or tarmaret. It may be of Latin origin, terra merita ("meritorious earth").

Botanical description

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## Appearance

Turmeric is a perennial herbaceous plant that reaches up to 1 m (3 ft 3 in) tall. Highly branched, yellow to orange, cylindrical, aromatic rhizomes are found.

The leaves are alternate and arranged in two rows. They are divided into leaf sheath, petiole, and leaf blade. From the leaf sheaths, a false stem is formed. The petiole is 50 to 115 cm (20–45 in) long. The simple leaf blades are usually 76 to 115 cm (30–45 in) long and rarely up to 230 cm (7 ft 7 in). They have a width of 38 to 45 cm (15 to 17+1⁄2 in) and are oblong to elliptical, narrowing at the tip.

## Inflorescence, flower, and fruit

## Turmeric flower

At the top of the inflorescence, stem bracts are present on which no flowers occur; these are white to green and sometimes tinged reddish-purple, and the upper ends are tapered.

The hermaphrodite flowers are zygomorphic and threefold. The three sepals are 0.8 to 1.2 cm (3⁄8 to 1⁄2 in) long, fused, and white, and have fluffy hairs; the three calyx teeth are unequal. The three bright-yellow petals are fused into a corolla tube up to 3 cm (1+1⁄4 in) long. The three corolla lobes have a length of 1.0 to 1.5 cm (3⁄8–5⁄8 in) and are triangular with soft-spiny upper ends. While the average corolla lobe is larger than the two lateral, only the median stamen of the inner circle is fertile. The dust bag is spurred at its base. All other stamens are converted to staminodes. The outer staminodes are shorter than the labellum. The labellum is yellowish, with a yellow ribbon in its center and it is obovate, with a length from 1.2 to 2.0 cm (1⁄2 to 3⁄4 in). Three carpels are under a constant, trilobed ovary adherent, which is sparsely hairy. The fruit capsule opens with three compartments.

In East Asia, the flowering time is usually in August. Terminally on the false stem is an inflorescence stem, 12 to 20 cm (4+1⁄2 to 8 in) long, containing many flowers. The bracts are light green and ovate to oblong with a blunt upper end with a length of 3 to 5 cm (1 to 2 in).

## Phytochemistry

Turmeric powder is about 60–70% carbohydrates, 6–13% water, 6–8% protein, 5–10% fat, 3–7% dietary minerals, 3–7% essential oils, 2–7% dietary fiber, and 1–6% curcuminoids.

Phytochemical components of turmeric include diarylheptanoids, a class including numerous curcuminoids, such as curcumin, demethoxycurcumin, and bisdemethoxycurcumin. Curcumin constitutes up to 3.14% of assayed commercial samples of turmeric powder (the average was 1.51%); curry powder contains much less (an average of 0.29%). Some 34 essential oils are present in turmeric, among which turmerone, germacrone, atlantone, and zingiberene are major constituents.

## Uses

### Culinary

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### Turmeric powder

Cooked vegetables with turmeric as one its key ingredients, referred to as Sabzi, a dish from India

### Ganghwang-bap (turmeric rice)

Patoleo – sweet rice cakes steamed in turmeric leaves consisting of a filling of coconut and coconut palm sugar prepared in Goan Catholic style

Turmeric is one of the key ingredients in many Asian dishes, imparting a mustard-like, earthy aroma and pungent, slightly bitter flavor to foods. It is used mostly in savory dishes, but also is used in some sweet dishes, such as the cake sfouf. In India, turmeric leaf is used to prepare special sweet dishes, patoleo, by layering rice flour and coconut-jaggery mixture on the leaf, then closing and steaming it in special utensil (chondrõ). Most turmeric is used in the form of rhizome powder to impart a golden yellow color. It is used in many products such as canned beverages, baked products, dairy products, ice cream, yogurt, yellow cakes, orange juice, biscuits, popcorn color, cereals, sauces, and gelatin. It is a principal ingredient in curry powders.Although typically used in its dried, powdered form; turmeric also is used fresh, like ginger.It has numerous uses in East Asian recipes, such as a pickle that contains large chunks of fresh soft turmeric.

Turmeric is used widely as a spice in South Asian and Middle Eastern cooking. Various Iranian khoresh recipes begin with onions caramelized in oil and turmeric. The Moroccan spice mix ras el hanout typically includes turmeric. In South Africa, turmeric is used to give boiled white rice a golden color, known as geelrys (yellow rice) traditionally served with bobotie. In Vietnamese cuisine, turmeric powder is used to color and enhance the flavors of certain dishes, such as bánh xèo, bánh khọt, and mì Quảng. The staple Cambodian curry paste, kroeung, used in many dishes, including fish amok, typically contains fresh turmeric. In Indonesia, turmeric leaves are used for Minang or Padang curry base of Sumatra, such as rendang, sate Padang, and many other varieties. In the Philippines, turmeric is used in the preparation and cooking of Kuning and Satay. In Thailand, fresh turmeric rhizomes are used widely in many dishes, in particular in the southern Thai cuisine, such as yellow curry and turmeric soup. Turmeric is used in a hot drink called "turmeric latte" or "golden milk" that is made with milk, frequently coconut milk.The turmeric milk drink known as haldi doodh (haldi means turmeric in Hindi) is a traditional Indian recipe. Sold in the US and UK, the drink known as "golden milk" uses nondairy milk and sweetener, and sometimes black pepper after the traditional recipe (which may also use ghee).

### Dye

The golden yellow color of turmeric is due to curcumin. It also contains an orange-colored volatile oil.Turmeric makes a poor fabric dye, as it is not light fast, but is commonly used in Indian clothing, such as saris and Buddhist monks' robes. It is used to protect food products from sunlight, coded as E100 when used as a food additive.The oleoresin is used for oil-containing products.

In combination with annatto (E160b), turmeric has been used to color numerous food products.Turmeric is used to give a yellow color to some prepared mustards, canned chicken broths, and other foods—often as a much cheaper replacement for saffron.

## Indicator

Turmeric dispersed in water is yellow under acid and brown under alkaline conditions. Turmeric paper, also called curcuma paper or in German literature, Curcumapapier, is paper steeped in a tincture of turmeric and allowed to dry. It is used in chemical analysis as an indicator for acidity and alkalinity. The paper is yellow in acidic and neutral solutions and turns brown to reddish-brown in alkaline solutions, with transition between pH of 7.4 and 9.2.

## Traditional uses

In 2019, the European Medicines Agency concluded that turmeric herbal teas, or other forms taken by mouth, on the basis of their long-standing traditional use, could be used to relieve mild digestive problems, such as feelings of fullness and flatulence.

Turmeric grows wild in the forests of South and Southeast Asia, where it is collected for use in classical Indian medicine (Siddha or Ayurveda). In Eastern India, the plant is used as one of the nine components of nabapatrika along with young plantain or banana plant, taro leaves, barley (jayanti), wood apple (bilva), pomegranate (darimba), Saraca indica, manaka (Arum), or manakochu, and rice paddy. The Haldi ceremony called Gaye holud in Bengal (literally "yellow on the body") is a ceremony observed during wedding celebrations of people of Indian culture all throughout the Indian subcontinent.

In Tamil Nadu and Andhra Pradesh, as a part of the Tamil–Telugu marriage ritual, dried turmeric tuber tied with string is used to create a Thali necklace. In western and coastal India, during weddings of the Marathi and Konkani people, Kannada Brahmins, turmeric tubers are tied with strings by the couple to their wrists during a ceremony, Kankana Bandhana.

Friedrich Ratzel reported in The History of Mankind during 1896, that in Micronesia, turmeric powder was applied for embellishment of body, clothing, utensils, and ceremonial uses.

## Adulteration

As turmeric and other spices are commonly sold by weight, the potential exists for powders of toxic, cheaper agents with a similar color to be added, such as lead(II,IV) oxide ("red lead"). These additives give turmeric an orange-red color instead of its native gold-yellow, and such conditions led the US Food and Drug Administration (FDA) to issue import alerts from 2013 to 2019 on turmeric originating in India and Bangladesh. Imported into the United States in 2014 were approximately 5.4 million kilograms (12 million pounds) of turmeric, some of which was used for food coloring, traditional medicine, or dietary supplement. Lead detection in turmeric products led to recalls across the United States, Canada, Japan, Korea, and the United Kingdom through 2016.

Lead chromate, a bright yellow chemical compound, was found as an adulterant of turmeric in Bangladesh, where turmeric is used commonly in foods and the contamination levels were up to

500 times higher than the national limit. Researchers identified a chain of sources adulterating the turmeric with lead chromate: from farmers to merchants selling low-grade turmeric roots to "polishers" who added lead chromate for yellow color enhancement, to wholesalers for market distribution, all unaware of the potential consequences of lead toxicity.

Another common adulterant in turmeric, metanil yellow (also known as acid yellow 36), is considered by the British Food Standards Agency as an illegal dye for use in foods.

## Medical research

Turmeric and curcumin have been studied in numerous clinical trials for various human diseases and conditions, with no high-quality evidence of any anti-disease effect or health benefit. There is no scientific evidence that curcumin reduces inflammation, as of 2020. There is weak evidence that turmeric extracts may be beneficial for relieving symptoms of knee osteoarthritis.

## Source

*https://en.wikipedia.org/wiki/Turmeric*