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Alpha Monoglycerides for the Safety of Poultry Industry

The challenge in modern animal production is to

develop non-antibiotic feed additives that

promote animal health in general and gut health

particularly in order to improve animal perfor-

mance and productivity. Alpha-monoglycerides

are a class of glycerides that are composed of a

fatty acid linked to the sn1-position of glycerol

through an ester bond and are known for their

These elements are generally found in the

mother's milk so children get this antibacterial

resistance from that. But these elements are

also found in coconut and the products alterna-

tive to antibiotic are made through it. The strong covalent bond of Alpha monoglycerides results

in multiple benefits compared to Antibiotics.

Alpha-monoglycerides are pH independent and

strong antimicrobial effects.

consequently do not dissociate, non-volatile, non-corrosive and heat stable during feed processing. Furthermore, alpha monoglycerides have a neutral taste and odor. Consequently, they are active in four different environments: water, feed, stomach, and the intestinal tract. Monoglycerides based products are available in dry and liquid form. Some of these products are also applied via drinking water.

Alpha-Monoglycerides have a much stronger antibacterial effect compared to their corresponding free fatty acids and it is also more cost effective than currently available antibiotics.

Dr. F H Ansarey Executive Director ACI Agribusiness



Figure: Comparison between Alpha monoglycerides and normal fatty acids.

Contents

- 3 Biotech Corner
- 4 Innovation and New Products
- 5 8 Events and Activities
- 9 12 Agri-tech and Communication
- 13 14 Readers' Corner



Acivet-Cipro Bolus



On 3 March 2017, ACI Animal Health launched Acivet-Cipro Bolus.



Gene Editing for Crop Improvement: CRISPR-CAS9: A game-changing technology

Gene Editing has been a concept circulating since the 1970s. Various techniques have been tried, tested, improved upon or modified based on accuracy and specificity of the technique.





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ACI received BSHS Award 2017

New Rice Strain Helps Predetermine Harvest Time



A new strain of rice that flowers within a certain period of time after being sprayed with commercial chemicals commonly used to protect rice from fungal diseases is now available, say Japanese scientists.

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Biotech Corner

Gene Editing for Crop Improvement: CRISPR-CAS9: A game-changing technology

Gene Editing has been a concept circulating since the 1970s. Various techniques have been tried, tested, improved upon or modified based on accuracy and specificity of the technique. The huge literature developed on CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) and CRISPR-CAS (CRISPER Associated System) indicates positive use potential in disease control system as well as gene editing for different purposes. The CRISPR-CAS confers resistance to foreign genetic elements providing a form of acquired immunity. Since 2014 when Jennifer Doudna and Emmanuelle Charpentier published (www.technologyreview.com) the use of CRISPR-CAS9 for gene editing of plants and animals there has been more interest grown for gene editing. The proteins CAS9 have been especially found to have a key role in the function of this immunity system. These bacteria have the ability to remember the DNA of previous foreign viral infections, and each time the same occurs the CRISPR-CAS9 mechanism disables it. This has opened doors and revolutionized medical science while it has already been applied to a number of gene editing cases of crops like wheat, corn, potato, rice, sorghum, orange and tomato.

Precision and speed of the technique are the primary reasons for the widespread utilization of the technique. CRISPR enables various forms of editing including targeted mutation for developing genetically engineered plants, both transgenics and cisgenics. The ability to disrupt normal gene activity by cutting and then leading to imprecise repairs leads to mutations which can either suppress or enhance the activity of the gene. "Gene drives" are also enhanced by using CRISPR, where a desirable gene is inserted into a plant which then boosts its efficiency of inheritance across a population. These types of stable gene edition can be done in 1-2 generations opposed to 6-7 generations through other techniques. The important message of CRISPR users is that it can now be used also in gene editing of non-transgenic crops also.

Software is readily available now to design the synthetic guide RNA (gRNA), which can either be inserted in self-developed vectors or ordered in from commercial DNA marker synthesizers with



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Potato plants growing at Cellectis a genetic engineering company.

inserted vector of choice. The most important segment is choosing the gRNA sequence. Normal PCR technique can be used to multiply the vector and the transfection method is carried out by Agrobacterium. Before this technology was available Zinc Fingers and TALENS were used to carry out similar studies, but the cost was around \$5000 per reaction, while using CRISPR it is around \$700.

An example of its use in Crop improvement would be increasing disease resistance and increasing the shelf life of Potatoes. In the USA a company named "Cellectis Plant Sciences" has been using CRISPR to develop Ranger Russet Potatoes which will not accumulate sweet sugars/convert carbohydrate to sweet sugars in cold storage, thus increasing its shelf life at a later stage. The modification will also suppress production of acrylamide, which is a suspected carcinogen while frying. Dupont has been working on drought-resistant wheat and corn which will take a few more years to be commercialized, but field trials began in 2016. The extensive assistance of Adeeba Raihan, Senior Scientist, ASRBC, ACI Ltd., is highly acknowledged.

Prof. Lutfur Rahman, Advisor, Agribusinesses, ACI Ltd.

Innovation and New Products

Acivet-Cipro Bolus

On 3 March 2017, ACI Animal Health launched Acivet-Cipro Bolus. Each bolus contains Ciprofloxacin HCI USP 1.164 g equivalent to Ciprofloxacin 1 g. Acivet-Cipro bolus (Ciprofloxacin) is a 2nd generation fluroquinolone and broad spectrum bactericidal antibiotic. Ciprofloxacin kills the bacteria by inhibiting DNA gyrase (Topoisomarase-II) enzyme. For Cattle, Acivet-Cipro bolus (Ciprofloxacin) is indicated for the treatment of disease caused by both gram positive and gram negative bacteria (Actinobacillus, Pasteurella, Streptococcus, E.Coli, Bordetella, Salmonella and also Mycoplasma) in following infections-respiratory tract infection, urinary tract infection, gastrointestinal tract infection and skin & soft tissue infection Acivet-Cipro is available in box. Each box contains 5x6 boluses in blister.



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ACILINA

ACILINA is 100% Natural Spirulina. Spirulina is a planktonic blue-green algae which has the highest quality digestible protein, amino acid, carbohydrate, fat, vitamin and minerals for fish and shrimp. It also naturally contains beta-carotene and other colour enhancing pigments. Using ACILINA we can ensure the optimum supply of the nutrients for fish and shrimp. The calcium present in ACILINA helps to prevent spirulan viral diseases. The presence of powerful antioxidant helps to reduce stress. Moreover, reproduction of fish and shrimp increases as a result of using ACILINA. It is manufactured by BIO-MARINE INC. (USA). On 2 February 2017 ACI Animal Health launched ACILINA which is available in 100 g packs.



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Events and Activities

ACI received BSHS Award 2017



ACI Ltd received the 'BSHS Award 2017' from Bangladesh Society for Horticultural Science (BSHS) as recognition for its outstanding contribution in research, development, marketing and popularization of horticultural produces in Bangladesh. The award was handed over to Mr. Sudhir Chandra Nath, Head of Business, ACI Seed by the chief guest Honorable Agriculture Minister Begum Motia Chowdhury, MP during the inauguration ceremony of BSHS National Convention 2017. The convention was held on 5 March 2017 at Bangladesh Agricultural Research Council (BARC), Farmgate, Dhaka. FAO Representative in Bangladesh Dr. Sue Lautze was the Guest of Honor in the opening ceremony.

Stakeholder Engagement: ACI Seed Events in Q1

ACI Seed continuously aims to reach new markets, promote new product features, build consumer buzz, generate PR, and re-engage existing customers. The goal of such stakeholder engagement is to build and foster key prospect and customer relationships for the long term. To do this effectively, ACI Seed conducted 5825 Farmers Training Program (FTP), 13 Farmers Campaign Program (FCP), 5865 Retailers Training Program (RTP), 13 DAE Meeting (DAEM), 5870 Farmers Field Day (FFD), 14 Spot Farmers Meeting (SFM), 6218 Retailer Contact (RC) nationally in the month of February 2017. Maximum (2628) numbers of demand generation programs (FTP, FCP, RTP, DAEM, FFD, SFM & RC) were conducted in Rangpur Zone (Bogra 715, Rangpur 935, Dinajpur 978) in February. Simultaneously 790 in Jessore Zone, 1284 in Comilla Zone, 1090 in Dhaka Zone demand generation programs were conducted.

On 22 February 2017, ACI Seed arranged a Regional Dealers' Meeting at Dinajpur. The 25 lead dealers of Rangpur region participated in the



meetings. The program was on the training and promotion of Papiya Super Bitter Gourd and Don-111 Maize for current Kharif-I season. The dealers showed interest to promote ACI's products with confidence. During the program, they fixed a projection to sell 11 MT of Don-11 and 110 Kg of Papiya Super in the current Kharif-I season in that region. Mr. Khadokar Riad Hassan, RSM, Rangpur and Mr. A. K. M. Shahinur Rahman, Sales Manager attended the dealers' meeting.

Events and Activities

More Tea Gardens to adopt ACI Fertilizers

A primary agreement has been made with BRAC for demonstrating the products of ACI in the Karnaphuli Tea Garden through introducing different Organic and Micronutrient fertilizer. Adopting ACI Fertilizers will enable the tea garden to save cost of Urea, and ensure effective and efficient use of fertilizers. ACI Fertilizer is introducing different cost effective and efficient products in the tea gardens of Bangladesh. For three years, ACI Fertilizer is supplying organic and micronutrient fertilizers to the tea gardens in Sreemongal and Chittagong. But, the scope of promoting foliar and compound fertilizers in tea gardens is broader. Business Director, ACI Fertilizer and Product Manager Md. Firoz Hossain have visited several tea gardens at Chittagong to discuss about balanced fertilization and their impact on tea production. Tea gardens have started to use the products of ACI Fertilizer especially foliar fertilizer with organic and Micro Nutrient fertilizer. As part of product promotion, NEB, Bioferti Super, Quick Potash, Promoter,

Bioferti for Mung Bean Cultivation

ACI Fertilizer arranged a week-long campaign on Bioferti at different places of Barisal and Patuakhali in March 2017. During this campaign, amount of land has been considered for demonstration to examine the consequences of Bioferti on Mung Bean. Bioferti is made from the most active seaweed species in the world. It improves the plant's natural resistance to the environmental stresses. Bioferti is used for maximizing the plant growth and yield. It has a great impact on vegetables and fruits production. It is compatible with most of the agro mechanicals and it can be used with chemical fertilizers. In Bangladesh, Mung Bean is traditionally cultivated in the winter months, in about 54982 hectares of land and about 34,400 Mio of grains are produced. In Barisal and Patuakhali this crop is widely cultivated.

Khalifar Hat, Kamar Hat, Kak Chira Bazar of Pathorghata were selected for demonstration. Several consecutive meetings were held at different areas at the presence of 40- 50 farmers and dealers. The whole campaign was conducted by



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Karnaphuli Tea Garden, Fatikchori, Chittagong

Parents have been promoted in different tea gardens.

ACI Fertilizer will conduct demonstration of foliar fertilizer like Organic and Micro Nutrient. There is a great opportunity to expand market share of Organic and Compound fertilizer through proper negotiations, quality products and proper promotional activities.



ACI Regional Sales Manager of Jessore - Mr. Zillur Rahman, Area Manager of Barisal - Mr. Nuruzzaman, Marketing Officer of Patuakhali - Md. Nadim Hossain and others. Barisal and Patuakhali are famous for cultivating Mung Bean and the demand of Mung Bean has been increasing day by day in all over the country. The pure natural and herbal product like Bioferti can be the solution to meet the extra demand of Mung Bean as well as for healthy and economic production of Mung Bean.

Events and Activities

NEB Field Day: Emerging New Opportunity



ACI Fertilizer has demonstrated NEB in different areas of Bangladesh i.e. Munshigonj, Chandpur, Dinajpur, Rangpur, Kurigram etc. On 27 March 2017, the performance of NEB on potato has been evaluated at Paragaon, Sreenagar in Munshigonj. Product Manager of ACI fertilizer Feroz Hossain, Area Manager, Market Development Officer, Marketing Officer along with almost 40 farmers, a number of big dealers (e.g. Monir Enterprise) participated in the field day. In the demonstrated area of Paragaon, Sreenagar, Munshigonj 42 Decimal land had been used where 21 decimal had been used as controlled area and 21 decimal as treated area. The result shows that in controlled area production is 26.76 MT/hector and in treated area it is almost 30.52 MT/hector. So, 14% yield has been gained through proper use of NEB. Like this, significant positive outcomes and feedback



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have been received from different areas of Bangladesh. Use of NEB proves that 30%- 34% cost savings of Urea can be made through proper use of NEB. In

Urea can be made through proper use of NEB. In the field of potato as well as other crops, NEB has tremendous growth opportunity.

ACI Motors Activation Meeting in March 2017

On 21 March 2017, a "Mechanics & Customer Meeting-2017" was organized at Faridpur Sadar. The event came as an occasion for building network as well as relationship wich stakeholders and was organized by M/S Maruf Machinery, Dealer of ACI Motors. Around 60 mechanics and customers attended this program from different upazillas of Faridpur. Guests from ACI Motors including Mr. Prabir Kumar Adhikary, Sales Manager, South Part; Mr. Al Masud, Manager, Service; Mr. Abdullah Al Mamun, Sr. Territory Manager, Faridpur gave their valuable speech for product promotion and network development. Moreover, Mr. Arafat Hossain, Assistant Product Manager, ACI Motors described ACI product features & benefits in the meeting. Mechanics and customers also gave their feedback about



ACI products. Lastly, Mr. Maruf Hossain, Proprietor of M/S Maruf Machinery gave his concluding speech on product promotion and marketing guidelines.

Events and Activities

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USE Helmet RIDE SAFE 2K17

With the tag line 'Ek Potaka Ek desh, Egiye Cholo Bangladesh', a Motorcycle rally named 'USE Helmet RIDE SAFE 2K17' was organized on 26 March 2017 in Dhaka. ACI Motors was the proud sponsor of this gathering of more than 1300 riders on the occasion of the Independence Day. The aim of this rally was to increase awareness for using helmets while riding motorcycles to increase road safety. The rally started from Manik Mia Avenue and ended at Bali Bridge near 300 feet road towards Purbachal. Mr. Subrata Ranjan Das, Chief Business officer, ACI Motors delivered his speech during the opening of Use Helmet Ride Safe 2k17 and highlighted the importance of using helmet as a safety measure for bike riders. Mr. Azam Ali, Director Sales, ACI Motors shared his insights with the crowd after the rally. Boishakhi TV and Jago FM were the media partners of the rally.



New Rice Strain Helps Predetermine Harvest Time

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A new strain of rice that flowers within a certain period of time after being sprayed with commercial chemicals commonly used to protect rice from fungal diseases is now available, say Japanese scientists. This new strain could one day allow rice farmers to dictate the timing of their harvest regardless of weather, temperature and other conditions that currently affect cultivation. Temperature, day length and other environmental cues determine when plants flower, making it difficult for farmers to control when to harvest their crops. While scientists have been able to artificially manipulate the flowering of small flowering plants like Arabidopsis thaliana, they had so far not been successful in such influence over cereal crops.

A group of Japanese scientists led by Professor Takeshi Izawa at the University of Tokyo's Graduate School of Agricultural and Life Sciences developed a new rice strain that flowers 40 to 45 days after being administered a common agrochemical, commercially known as Routine or Oryzemate, that prevents rice from being infected by a damaging disease called rice blast.

The scientists first created a non-flowering strain by overexpressing a gene (Grain number, plant height and heading date 7, Ghd7) that suppresses flowering genes (florigen genes) which induce flowering at the tip of plants under short-day conditions. Then



A new rice strain flowers only when administered Routine or Oryzemate, a common agrochemical developed to fight fungal disease. Unsprayed plants, on left, did not flower, while the ones administered the chemicals, on right, flowered 35 days after they were sprayed. Photo Credit: 2017 Takeshi Izawa

Izawa and his colleagues modified the florigen gene Heading date 3a (Hd3a) in the non-flowering rice strain so that it would be activated in response to certain agrochemicals. When they tested the rice strain in laboratory conditions and in pots under natural field conditions in Tsukuba, a city 70 km north of Tokyo, in Ibaraki Prefecture, the researchers observed that the new strain flowered in about 45 days after administering the chemicals. In the experiment spanning over two years, they repeatedly observed flowering only after spraying.

(Source: Agriculture and Food News, ScienceDaily. www.sciencedaily.com)

Trees' Role Extends Beyond Carbon Consumption

Forests play a complex role in keeping the planet cool, one that goes far beyond the absorption of carbon dioxide, new research has found. Trees also impact climate by regulating the exchange of water and energy between Earth's surface and the atmosphere, an important influence that should be considered as policymakers contemplate efforts to conserve forested land, said the authors of an international study that appears in the journal Nature Climate Change.

"Forests play a more important role in cooling the surface in almost all regions of Earth than was





previously thought," said study co-author Kaiguang Zhao, assistant professor of environment modeling and spatial analysis at The Ohio State University. "This really affirms the value of forest conservation and protection policies in the fight against climate change," Zhao said. Until now, scientists have had an incomplete picture of how, where and when ecosystems influence climate locally. By addressing

all three questions simultaneously, the researchers were able to offer new insight into how land-use decisions are shaping local climates. The researchers created a model that combined locally collected meteorological data with data from satellites and other Earth observation systems.

(Source: Agriculture and Food News, ScienceDaily. www.sciencedaily.com)

Ant Hill Mulch Improves Soil Moisture

Ants can be annoying little insects. In your home, they make army-like lines to any crumbs on your floor. In your home's frame, carpenter ants can do a job of eating away your walls. But what about outside? Do ants play a positive role in your yard? Your garden? What about in a farm field? Research undertaken by scientists in China reveals that ants are hardworking and beneficial insects. In the activities of their daily lives, ants help increase air, water flow, and organic matter in soil. The work done by ants even forms a type of mulch that helps hold water in the soil.

Ants are busy insects. They dwell in the soil, and build their homes by burrowing tiny holes, channels, and chambers. Soil scientists refer to these as macropores. Where do ants place the soil they are digging out? On the soil surface. The tiny clumps we see as an ant hill are what researchers call aggregate mulches. In addition to creating the aggregate mulches, ants help the soil environment by "bringing down food sources from outside," says soil scientist Tongchuan Li. "Types



Ant hills can actually serve as a mulch, according to research done in China. Photo Credit: Photo courtesy T. Li

of food include the bodies of insects, leaves, sugar water, and the 'honeydew' of aphids. The big diameter of the nest channels (4.1-6.6mm) and the chambers also can improve the transport of air with frequent ant activities."

(Source: Agriculture and Food News, ScienceDaily. www.sciencedaily.com)

Mustard Seeds without Mustard Flavor

University of Copenhagen and the global player Bayer CropScience have successfully developed a new oilseed crop that is much more resistant to heat, drought and diseases than oilseed rape. The breakthrough is so big that it will feature as cover story of the April issue of Nature Biotechnology, a journal about biotechnology research. Should the global warming continue, a golden rape field under the summer sun may soon become but a distant memory. Researchers have now developed a mustard crop with all the good properties of rape, but which, in addition, also is resistant to drought and heat.





A blooming yellow rape field marks the beginning of summer in Northern Europe. However, if global warming continues, the beautiful view of golden fields under a blue summer sky may soon become but a nostalgic memory. However, there is hope within sight in the form of a new robust oilseed crop that looks like rape but can withstand the climate changes.

(Source: Agriculture and Food News, ScienceDaily. www.sciencedaily.com)

Health Benefits of Roselle Products

The products made from Roselle / মেন্ডা / চুকুর (Hibiscus sabdariffa var sabderiffa) have following health benefits:

- Lower bad cholesterol
- ✓ Anti-aging
- ✓ Anti-cancerous
- Reduce high blood pressure
- ✓ Reduce blood sugar
- ✓ Reduce body fat
- ✓ Assist in weight loss
- Promotes kidney functions
- Helps digestion
- Prevent common cold



Reference: Islam AKMA, TS Jamini, AKMM Islam and S Yeasmin. 2016. Roselle: A Functional Food with High Nutritional and Medicinal Values. Fundamental and Applied Agriculture, 1(2): 44-49

Bt Cotton Varieties with Reusable Seeds Developed

Scientists at Punjab Agricultural University (PAU) in India has developed genetically engineered Bt cotton seeds that can be reused, thus saving farmers' input costs. These cotton varieties are PAU Bt 1 and F1861. Rajasthan Agricultural University also developed RS 2013. The F1861 and RS 2013 varieties were transformed into Bt version by Central Institute of Cotton Research.

"The notification for these varieties could be out as early as next month after ICAR's scheduled meeting," said Dr. Baldev Singh Dhillion, Vice Chancellor of PAU. He said that the Indian Council of Agricultural Research has asked the university to put up proposal regarding the release of these varieties. Dr. Dhillon also said that the process for multiplying the seeds would begin this year. "We are expecting that by next year we will be able to distribute seeds to farmers for sowing in fields. Surely, by 2019, we will distribute



seeds on large scale," he said. The prices of these new Bt cotton seeds are expected to be much lower than the prevailing prices of Bt cotton hybrids.

(Source: Crop Biotech Update, International Service for Acquisition of Agri-Biotech Applications. www.isaaa.org)

Genome Reprogramming for Synthetic Biology

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The ability to go from a digitized DNA sequence to a predictable biological function is the main principle in synthetic biology. Genome engineering tools enable rewriting and implementation of engineered DNA sequences. The recent developments of new programmable tools to engineer genomes have also sparked a multitude of advances in synthetic biology.

These tools, such as the CRISPR-Cas9 system, enable RNA-guided redesign of organisms and the execution of synthetic gene systems. These new directed evolution methods generate organisms with radically restructured genomes, including restructured organisms with useful new phenotypes for biotechnology, such as bacteriophage resistance and increased genetic stability. Advanced DNA synthesis and assem bly methods have also made possible the construction of fully synthetic organisms. Arizona State University's Kylie Standage-Beier recently summarized these recent



advances in programmable genome engineering tools as well as their impact on synthetic biology.

(Source: Crop Biotech Update, International Service for Acquisition of Agri-Biotech Applications. www.isaaa.org)

Making Cows More Environmentally Friendly

Scientists at the Royal Botanic Gardens, Kew, Scotland's Rural College (SRUC) and the Senckenberg Biodiversity and Climate Research Centre, Frankfurt have published a paper revealing an important discovery surrounding plants used to feed livestock; that plants growing in warmer conditions are tougher and have lower nutritional value to grazing livestock, potentially inhibiting milk and meat yields and raising the amount of methane released by the animals. Higher amounts of methane are produced when plants are tougher to digest -- an effect of a warmer environment. Methane is a potent greenhouse gas, around 25 times better at trapping heat than carbon dioxide. More than 95% of the methane produced by cows comes from their breath through eructation (belching) as they "chew the cud."

Dr Mark Lee, a research fellow in Natural Capital & Plant Health at the Royal Botanic Gardens, Kew who led the research says; "The vicious cycle we are seeing now is that ruminant livestock such as cattle produce methane which warms our planet. This warmer environment alters plants so they are tougher to digest, and so each mouthful spends more time in



Regions in light grey are currently unsuitable for ruminant livestock, and regions beyond the range of the dataset are shaded dark grey. Photo Credit: Dr Mark Lee

the animals' stomach, producing more methane, further warming the planet, and the cycle continues. We need to make changes to livestock diets to make them more environmentally sustainable."

(Source: Agriculture and Food News, ScienceDaily. www.sciencedaily.com)

Readers' Corner

Believe it or not!

 Lemons are classified as berries, even though we all think that a lemon is a fruit.

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- Back in the day lemons used to be a rare "commodity". In fact, they were so rare that the kings and queens used to give them to each other as gifts!
- During the Renaissance, women used lemons as a make-up tool: they used the lemon juice to redden their lips.
- In 1849, during the California Gold Rush, the miners were happy to pay ridiculous amount of money for one lemon.
- Rich Victorians used to grow lemon trees in their homes. That meant they were wealthy enough to afford it and people respected them for that.

Nutrition Chart



Source: USDA

The health benefits of lemon are:

Tips

- Lemons are acidic to begin with but they are alkaline-forming on body fluids helping to restore balance to the body's pH.
- Lemons are rich in vitamin C and flavonoids that work against infections like the flu and colds.
- The citric acid in lemon juice helps to dissolve gallstones, calcium deposits, and kidney stones.
- The symptoms of eye disorders, including diabetic retinopathy have been shown in research to improve due to the rutin, found in lemons.
- Experiments have found the juice of lemons destroy the bacteria of malaria, cholera, diphtheria, typhoid and other deadly diseases.

BIOLIFE

Readers' Corner

Sharing is caring!

Is it possible to use a lemon as a battery for classroom experiments? Yes! It's possible.

It may sound odd using lemons to produce electricity, but it's definitely possible. The "lemon battery" uses the juice inside as an electrolyte, and galvanized nails are inserted as electrodes. Wires are then connected to the lemon, and if a group of lemons is wired in series, the collective lemon battery can be used to power a small LED light. According to Wikipedia, the typical voltage output of one lemon is 0.9 volts. Not exactly "shocking", but certainly interesting!







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