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The Quest for Justice in the Honey Industry

(Fake vs. Authentic Honey)

By Ron Phipps

Introduction

The struggle against Food Fraud and the quest for Food Authenticity and Integrity are global in nature. Healthy and vigorous industries integrate the incentives to produce and consume the products they market. In contrast, industries which are permeated by Food Fraud and Adulteration inevitably fail to achieve this essential integration. In January 2019, Apimondia issued a statement to the international beekeeping and honey industries regarding the systemic challenge of honey adulteration, a challenge which can no longer be swept under the rug.

The American honey industry will benefit from marketing high quality honey, with its charm, diversity and delicious flavors. The romance and health halo of pure honey, and the role of beekeeping in global food security, food safety and ecological sustainability, must become essential parts of the foundation of the international honey market.

It has been noted that consumption of retail honey in various regions declined in 2018, both in aggregate and more importantly on a per capita basis. Alarming, that decline has been observed in geographical areas which are trendsetters and centers for consumption of organic foods and concern for ecological sustainability. It is an increasingly accepted premise that this emerging threat to the incentive to consume honey is directly correlated with the decline in quality and the presence of honey which has been subject to the multiple forms of adulteration existing in the current international honey market.

We should bear in mind that the success of positive creative marketing programs is manifest in: 1) increase of total consumption; 2) most importantly, increase in per capita consumption; 3) increases in prices; 4) increases in quality; 5) increases in the diversity of products; 6) increased consumer awareness of the history, romance and charm of the product; 7) establishing, where the science permits, the health halo of authentic natural foods; 8) the prevalence of authenticity and the absence of fraud; 9) developing interest in the demographics which will promote and insure new generations of consumers; 10) increasing attraction by the romance of the product and its important virtues, including food security and ecological sustainability. Preserving and enhancing the positive image of honey depends upon ridding the market of adulterated honey.

The current crisis in the honey industry consists of a concurrent collapse of the incentive to produce and the stress upon the incentive to consume honey. Beekeepers throughout the world feel this crisis as do honest actors at all levels within the supply chain.

The 50th Anniversary of the AHPA

During January 2019, the American Honey Producers Association celebrated its 50th Anniversary. At the convention in Phoenix there was a wide range of expertise brought together to discuss the problems of food fraud, label fraud, customs fraud and adulteration in respect to the American and international honey markets.

The AHPA convention opened with presentations by AHPA President Kelvin Adee, Prof. Michael Roberts, of the Resnick Program for Food Law and Policy at the UCLA School of Law, Prof. Stephan Schwarzingler, world expert on the use of Nuclear Magnetic Resonance (NMR) for adulteration and origin testing for honey, and myself, Vice President of the Apimondia Scientific Commission on Beekeeping Economy. It was pointed out by Prof. Schwarzingler that NMR tests can detect chemical and physical evidence of adulteration with sweeteners using parameters which are independent of the extensive data base consisting of over 19,000 samples underlying NMR detection of country of origin and adulteration in various modes.

Dr. Stan Daberkow, Economist Emeritus of the USDA, described the economic implications to beekeepers of economically motivated adulteration. Experts on the phenomena of adulteration of honey described the difficulties for authentic honey to compete with adulterated honey, and leading American beekeepers described the impact of adulteration of honey on the overall future of agriculture and ecology. Reports of direct observation of adulteration practices in various producing countries came up in discussions.

The development of bottom up pressure for a honey market of authentic high quality honey, given the demographic trends in America, was discussed. Experts on food fraud in general described the growing concern among retailers to exercise their social responsibility to protect their customers from food fraud. Prof. Roberts will be preparing a second White Paper on the issues of Food Fraud in the American honey market. This white paper will see the light of day.

This gathering brought together the strongest and broadest expertise for understanding current realities in the honey market. The integration of bottom up and top down pressure was advocated.

International Honey Market

It is increasingly clear that many international beekeepers and honey exporters devoted to providing the market with authentic honey have shifted their attention to markets like continental Europe, Japan and the Middle East, where high quality and pure honey is valuable

and where concurrently it is more difficult for fake honey to enter the market. Unfortunately, the U.S. market has been the preferred market for honey of low quality, low price and questionable authenticity. The low prices possible for fake honey have relentlessly driven down prices for authentic honey, whether produced in the U.S., Canada, Argentina, Brazil, Mexico, or elsewhere. Import volumes in 2017 and 2018 reflect the growing impact of two countries in Asia, and the price differentials which have persisted over time.

Chart 1 shows the comparison between the imports from India and Vietnam (combined), with average prices below \$.80/lb. FOB, and total import volumes from eight countries, with average prices significantly higher.

Chart 1. US Import Volumes 2017 and 2018; The Two Tiered Honey Market

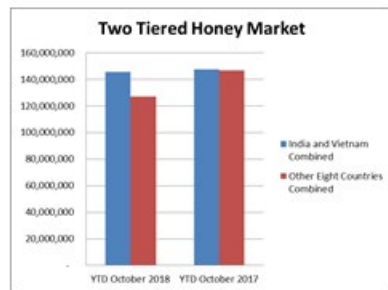


Chart 2. Value/lb. of Bulk Honey Imports 2014-2018

Prepared by Dr. Stan Daberkow

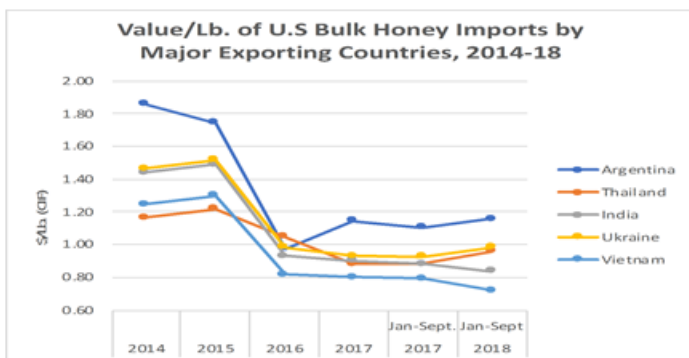
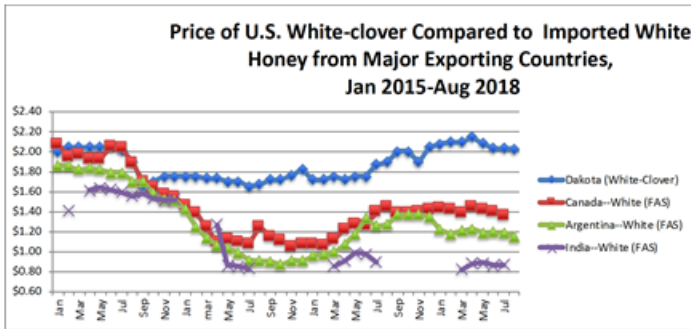


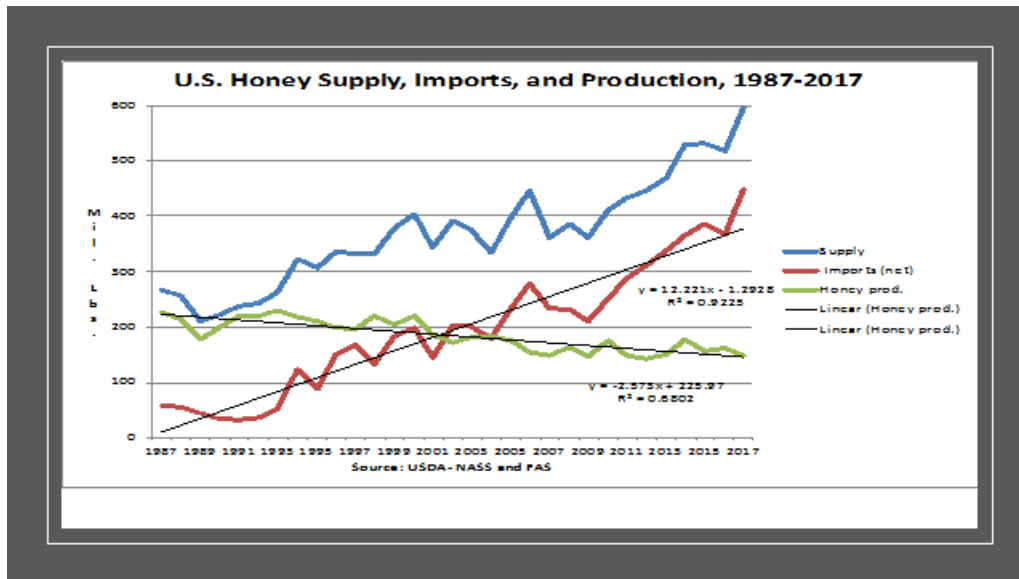
Chart 3. Price of US White compared to Canadian, Argentine and Indian White

Prepared by Dr. Stan Daberkow



After his review of recent honey trade reports, Dr. Daberkow commented: “Given the mostly stable supply of domestic honey over the last 10 years, there is likely in increasing share of imported “honey” pouring into the retail table market.” The dramatic growth of the total U.S. honey supply over the past 10 years is illustrated in chart 4.

Chart 4. Honey Supply, Imports, Production 1987-2017 (Prepared by Dr. Stan Daberkow)



According to the Nielsen report for 2018, branded honey sales gained \$13.3 million, while private label discounted honey sales decreased. This trend shows a preference for products with perceived higher quality. International data cited by Prof. Roberts indicates that the phenomena of food fraud and adulteration, whether in honey, olive oil, coffee or other products is greatest in private label, low-priced, multi-origin products. It is well known in marketing that for consumers low prices suggest both low quality and low value in the price/quality relation.

In February in the large international exhibition Gulfood held in Dubai, representatives from consuming and producing countries met. Week by week, the prices of Asian honey had continued to drop, including LA (Light Amber), Amber, ELA (Extra Light Amber) and White colors. By the time of the Gulfood conference, prices had declined 15 to 20% reaching unprecedented and unsustainable low levels. The use of resin technology, which was developed by Chinese manufacturers, opened the door to the production of ELA and White honey from countries whose climate and floral sources are inconsistent with large amounts of ELA and White. This anomaly is under increasing international scrutiny. It is well known that it was Asian exporters who publically introduced and lauded the use of Chinese resin technology as a means to eliminate residues and antibiotics, and transform dark honey with strong flavors to light, mild flavored honey. It was also erroneously stated in January 2016 that the use of resin technology was approved by the U.S. FDA. The predominant message from Gulfood is that producers of legitimate, authentic pure honey cannot compete with honey produced under what has been called the Eastern or Asian model of honey production.

It is noteworthy that the crisis of low commodity prices is also being suffered in the coffee industry. Prof. Peter W. Roberts from Emory University is spearheading a conference to develop a program to protect coffee producers from market manipulation. Prices over the past 4 years have been in an extreme collapse, which is reducing the incentive to produce coffee. Nuclear Magnetic Resonance (NMR) tests have been used as a scientific tool to distinguish robusta beans from Arabica coffees, which are higher quality and more valuable. Fraud in labeling, marketing and sales of Arabica coffee may be a factor in the overall price collapse. The initiative is the "Coffee Price Response Initiative."

Apimondia, Standards, Modes of Adulteration and Illicit Modes of Production

Solving the problem of adulteration requires standards which are strong rather than weak, relevant rather than archaic, comprehensive rather than narrow. The standard must be comprehensive since it will not suffice to detect and close out only some modes of adulteration while leaving the door wide open for other modes. Strong, relevant and comprehensive standards can be formulated if, but only if, there is awareness of the contemporary modes of illicit production of honey and the sophisticated methods of adulteration of honey. The purposeful blending of bioengineered C3 sugars, as well as the blending of pollen to disguise country of origin, all of these modes of adulteration have their progenitor in the China model, which has been generalized into the Asian model.

Completing the circle requires integrating knowledge of contemporary, illicit modes of production, sophisticated modes of adulteration, and the development and utilization of a toolbox which includes all the most advanced scientific methods of detection. Closing the door

to fake, adulterated honey is essential if we are to open the door to the creative, positive marketing of this product of nature.

The decline of the incentive for production of authentic honey by beekeepers has as its foundation the presence in the marketplace of adulterated honey. There are those who want to mount the white stallion and gallop to Fort Knox. But in their wake US honey producers struggle.

Recently, Apimondia released a Statement on Honey Fraud. This statement is extremely important and reflects many dimensions of the problem which I, Prof. Norberto Garcia, Prof. Roberts, and others have stressed in various articles. Because the statement is so well-articulated, and has been released from the largest organization of beekeepers in the world, we are quoting extensively from it so that the position of Apimondia can be understood in a comprehensive way. It is important to understand that the U.S. government, and authorities in other honey consuming countries, officially pays attention to and follows Codex Alimentarius.

Chart 5. Apimondia Newsletter excerpts

Quotes from Honey a Natural Product (*Apimondia Newsletter, December 2018*):

These intrinsic characteristics of honey come from a perfect combination and interaction of both plant and animal kingdoms. The botanical origin of honey mainly determines its color, its aromas, and its major chemical components.

Codex Alimentarius' (CA) definition of honey (1981): "Honey is the natural sweet substance produced by honey bees from the nectar of plants or from secretions of living parts of plants or excretions of plant sucking insects on the living parts of plants, which the bees collect, transform by combining with specific substances of their own, deposit, dehydrate, store and leave in the honey comb to ripen and mature."

APIMONDIA also adheres to the essential composition and quality factors of honey defined in CA through Section 3: "No pollen or constituent particular to honey may be removed except where this is unavoidable in the removal of foreign inorganic or organic matter." Besides pollen, all sugars, proteins, organic acids, microelements, and water are considered constituents particular to honey.

The definition of CA further rules out any additions to, nor any treatment intended to change honey's essential composition or impair its quality, for example: the use or ion-exchange resins for removing residues and lightening the color of honey, and the active removal of water from extracted honey with vacuum chambers or other devices.

If, under certain climatic conditions, honey even contained in capped combs has a moisture content over the requirement of CA in Section 3.4, APIMONDIA considers acceptable to store

those frames with a little extra excess humidity in a dry room in order to adjust honey moisture in the frames to the required limits. No water reduction is allowed after honey has been extracted from frames.

APIMONDIA supports honey production methods that allow bees to fully do their job in order to maintain the integrity and quality of the product for the satisfaction of consumers, and rejects the developing of methods intended to artificially speed up the natural process of honey production, through an undue intervention of man and technology that may lead to a violation of CA standard (Table 1).

Key Excerpts from Table 1: Honey production methods that do not comply with the CA standard

Mode of Production:

- Harvesting of immature honey by the beekeeper
- Honey dehydration with technical devices, such as vacuum dryers, etc.
- Use of Ion-Exchange resins to remove residues and lighten the color of honey
- No pollen or constituents particular to honey may be removed.
- Feeding bees during a nectar flow

Essential elements present in a case of food fraud:

- 1) Intentionality
- 2) Violation of law (the CA definition of honey)
- 3) Purpose of economic gain
- 4) Consumer disappointment

Types of honey fraud:

- 1) Dilution with different types of syrups such as those produced from corn, cane sugar, beet sugar, rice, wheat, etc.
- 2) Harvesting of immature honey
- 3) Using ion exchange resins to remove residues and lighten honey color
- 4) Masking or mislabeling the geographical or botanical origin of honey

The product which results from above-described fraudulent methods shall not be called “honey”, neither the blends containing it.

Recommendations include “a broad awareness of the beekeeping community, of consumers, of packers and retailers, and a fluid collaboration with national authorities in order to update their official methods of fraud detection. Honey should be able to be traced through all the chain back to the beekeeper, to the botanical floral source of the product, and to the geographic location of the apiary.”

The international momentum for addressing food fraud is mounting, with international scientific conferences, webinars and industry events crowding the calendar in 2019. These events include meetings among scientists, a presentation on NMR testing for honey at the American Association of Organic Chemists, meetings in France on honey adulteration, and Apimondia's meetings in Montreal in September, including a section chaired by Dr. Schwarzingger.

The Chinese have long established what Walter Haefeker, President of the European Beekeepers Association has described as sophisticated "beehive factories." Asian exporters have praised in public forums the use of resin technology for its ability to remove antibiotics and lighten colors. Resin technology also transforms honeys which are non-marketable because of their aromas into mild, readily blendable honeys. The phenomenon of economically-motivated adulteration is found in products labeled as honey within the retail, industrial/manufacturing industries using honey and the food service industries. The brazenness of adulteration of honey has been openly advertised by China's largest resin producer, Sunresin "With our effort, many honey companies and juice producers of many countries are successfully getting rid of the barriers from US."

Fortunately, modern modes of detection of adulteration in each of the modes mentioned, have been developed. Furthermore, they can detect those signs, chemical markers, parameters and variables which indicate and expose modern modes of adulteration.

The honey industry and beekeepers have both the ability and the necessity to implement more vigorous, comprehensive and formal traceability protocols. Those protocols must make demands on all participants in the supply chain, from beekeepers to collectors to processing factories, exporters, importers and packers in the consuming countries. Such traceability regimes, furthermore, can be contractually required by retailers, manufacturers and food service companies of products which are described as "honey."

Any independent inspectors must be fully competent in understanding the nature of honey, the modes of production and sophisticated modes of adulteration. They must not only be professionally competent but also completely independent, transparent and with impeccable integrity. Industries that suffer food fraud and economically motivated adulteration are notorious for their desire to police themselves and their inability to effectively police themselves.

Adulteration in various forms can occur on 1) the beekeeper level; 2) intermediary collection level; 3) export factory level; 4) packing/processing level in the consuming country. All four of these arenas of potential adulteration have been observed throughout the globe to be actual sources of adulteration and food fraud. Because of this sad reality, authentic traceability systems must be vigorous and comprehensive to require knowledge of what occurs at each of

these sites of potential adulteration. The global movement for food authenticity is inexorably moving toward this type of comprehensive traceability. Additionally the tool box for discerning adulteration at any and all points of potential adulteration must be a toolbox that includes all of the tools, including the most scientifically sophisticated tools for detection. It is a relatively simple scientific task given the powerful computers available in the contemporary world to establish comprehensive chemical and physical profiles of all the world's honey sources as well as the chemical and physical profiles of the blends found in the market. We are not in the dark ages. Purity and authenticity must prevail over narrow commercial interests.

Traceability Model

An enhanced and vigorous traceability regime would include not only purchase data including quantities, prices and types of honey purchased at each level in the supply chain, but also would guarantee that:

- 1) no illicit modes of production have been utilized, including extraction of immature uncapped honey or blending of extraneous pollens;
- 2) no illicit modes of adulteration have been utilized, including blending of extraneous sweeteners including C3, C4 and bio-engineered sweeteners;
- 3) no resin technology has been applied at any stage during processing;
- 4) no artificial mechanical means have been utilized to reduce high moisture levels of immature, uncapped honey;
- 5) the honey has been subject to the most sophisticated, advanced scientific methodologies, including but not limited to NMR, and analyzed with respect to those variables which indicate illicit modes of production and/or application of sophisticated modes of adulteration;
- 6) if the honey has been blended, filtered or processed, the details of such processing are accessible.

In the reference book *The Hive and the Honey Bee* (2015), in the marketing chapter written with Dr. Daberkow and important contributions from Dr. Vaughn Bryant and Prof. Norberto Garcia, we predicted that in the new millennium we would see:

“The Era of Enhanced Transparency, Traceability, Rule of Law

The Era of Creative Marketing”

The tendency to suppress, deny or delay the utilization of advanced science, more comprehensive data bases and attention to key parameters and variables which are indications of honey fraud will ultimately fail. Science follows the evidence. Science utilizes all the most advanced tools in the scientific toolbox. It is only those with economic motivation who seek to

suppress evidence and fail to utilize techniques such as NMR and other methodologies. The key imperative is to utilize and continuously develop science to detect those chemical and physical variables which demonstrate the types and modes of production which flood markets with adulterated products and harm the interests of honest producers of authentic honey.

Honey Markets by Country

Argentina

In Argentina's spring in 2018 there was optimism about the quantity of the new crop, but temperatures were lower than expected in early 2019 and the volume of white colors was forecast to be less than normal. Reports of colony losses of 40% were heard. Floods in northern regions affected the crop in those areas. Still a total crop of 60,000-70,000 metric tons is expected but a shift to darker colors has occurred.

During 2018, the value of the U.S. dollar nearly doubled against the peso, but the dollar equivalent price paid to beekeepers declined from the \$2.20/kg range in January to the \$1.70/kg range in September. The U.S. took about 50% of Argentina's honey exports in 2018, with Germany at 19% and Japan at 5.6%. Total U.S. imports from Argentina for the first 11 months in 2018 reached 65 million pounds. A shift to markets in Europe, Japan and the Middle East, where authentic honey is demanded and high quality honey is prized, is underway in 2019. The more the prices collapse in the U.S., the greater becomes the emphasis on exporting Argentina's honey elsewhere.

The Argentine honey industry has been seriously disrupted not only by international competition with adulterated honey but the economic crisis suffered by the Argentine government, confronted with international default on its significant national debt. The IMF announced last August that they would provide a large loan to the Argentine government so the government would not default. However, there were serious conditions on the loan, which led to the imposition of export duties on some products, including honey, of about 12%. Bearing the burden of these unexpected export duties, in September of 2018 companies rushed to export as much honey as possible to those international markets which prized their quality and authenticity and paid the highest prices. Supply, qualities, contracts were thrust into a chaotic situation, especially insofar as exporters did not declare force majeure conditions.

Argentina's economic conditions have been unusually difficult. Inflation spiked from 25% to 35% between April and July of 2018. A member of Argentina's honey industry said in 2019, "This is one of the strangest markets I have seen."

Brazil

The devolution of honey pricing has resulted in the smallest difference between prices for organic and conventional honey that have been seen; in fact, some organic honey is being sold at lower prices than conventional honey! This defies the trend of organic products receiving premium prices. Beekeepers in Brazil are disappointed with the decline of prices that began in July, 2017. Many Brazilian exporters are turning to cultivate other international markets.

In recent weeks, news reports about the devastating dam collapse in Brazil have been prominently featured, raising questions about honey production. Producing areas for organic honey, however, are hundreds or thousands of miles from the mountainous mining region of the dam, and will be unaffected, according to Brazilian honey exporters.

In the 4th quarter of 2018, crops in southern Brazil failed for lack of rain, and hopes are that the rains will be enough for the summer/autumn crop in Brazil's northeast.

U.S. Imports from Brazil were over 43 million pounds as of November, 2018, and exports to the U.S. declined relative to 2017. In 2018, Brazil's total honey exports to the world reached a historic high of nearly 63 million pounds (28,500 metric tons), with about 10% destined for Germany and 80% to the U.S.

Canada

U.S. imports in 2018 were up above 28 million pounds, with prices for white up about 12% compared to 2017. Canadian beekeepers are pressing their government for more stringent standards of purity.

India

In early 2019, it was reported that export prices had declined to extraordinarily low levels and there was concern about the amount of carryover from the 2018 crop. Average U.S. import values in 2017 were \$0.84/lb. (all colors) and went down to \$0.79/lb. in 2018 (\$0.84 for White and \$0.79 for ELA). The volume of U.S. imports from India was over 80 million pounds for the first 11 months in 2018, down by about 7 million pounds compared to 2017. For the past 15 years, the U.S. has purchased over 95% of India's exported honey!

Mexico

U.S. imports from Mexico increased in volume and value, reaching about 6 million pounds in 2018, including organic and specialty honeys.

New Zealand

New Zealand reported honey exports to the U.S. were worth U.S. \$49 million in 2017, with the U.S. the second most valuable export market after China. U.S. imports were over \$29 million for the first 11 months of 2018. Some Light Amber imports were valued at \$23.56/lb., and the average per pound cost for all New Zealand honey imports was \$9.77/lb. Manuka is the main type of honey exported by New Zealand, and many U.S. consumers are aware of health benefits that Manuka may provide. Retail shelves in the U.S. carry high priced Manuka honey, much of which is being marketed as 100% New Zealand origin and certified to contain Methylglyoxyl (MGO).

Ukraine

Ukraine is reported to have a 35,000 metric ton carryover from 2018, and is anticipating 100,000 metric tons for the 2019 crop. The export price has declined from \$2100 to \$1900 C&F per metric ton for ELA to the US. The Ukrainian honey industry consists of a huge number of small producers who engage in general agricultural production. Sunflower is a major floral source and ELA the major color.

Vietnam

Exporters have indicated that that the cashew and rubber harvest was very poor, and the unpredictable climate condition makes forecasting difficult. Some beekeepers in Vietnam are losing interest after three successive years of financial losses.

U.S. imports from Vietnam were up slightly in 2018 at 65 million pounds, averaging \$0.66/lb., a price decline of 10% compared to 2017. Vietnam honey is being imported into Canada.

Efforts are underway in Vietnam to produce some specialty honey types and improve qualities. Vietnam has the potential to serve as an Asian model of authentic honey production. Responsible members of the Vietnamese honey industry have affirmed that Vietnam surely can produce authentic, mature honey extracted from capped combs. However, to do so they need higher prices than the low prices demanded by the U.S. industry. Once again, the correlation between price and authenticity rears its head.

Vietnam's extensive aging Robusta coffee fields are currently being replanted with Arabica varieties, which are more valuable. Similarly honey producers could alter their production modes in a manner that could allow Vietnam to fully comply with the enhanced traceability regime described above.

International Food Fraud

Allegations of honey adulteration have been reported in India, China, Australia, New Zealand and Europe. In India and China there are also reports of Food and Drug fraud, seizure of records and illegal destruction of records. The adulteration of honey on retail shelves in India and China directly affects the people of India and China.

Chart 6 – Indian retail samples found to be adulterated

Adulteration ‘revelation’: 10 out of 10 honey brands tested in India found to violate FSSAI standards

Lab tests have revealed that [all 10 out of 10 brands of honey that were tested in India are in violation of Food Safety and Standards Authority \(FSSAI\) parameters.](#)

The lab tests were conducted by consumer organisation Consumer Voice, who deemed these to be *‘authenticity tests’*, and said that the results were a *‘revelation’*.

Tests were carried out for C4 sugars (a means of determining whether honey has been adulterated Pure honey should not contain C4 sugars above certain limits, although this is currently being disputed) as well as a range of other quality, safety and acceptability parameters.

The ten brands of honey tested were: 24 Mantra, Badiyanath, Dabur, Fresh & Pure, Hitkary, Himalaya, Khadi, Patanjali, Reliance and Zandu.

According to FSSAI parameters, C4 sugars should make up no more than 7%. Nearly all of the brands failed the C4 sugar testing.

Source: <https://www.foodnavigator-asia.com/Article/2019/01/17/Safety-First-Nestle-India-Australian-gluten-free-foods-adulterated-Indian-honey-and-more-feature-in-our-food-safety-round-up>

The pervasiveness of food fraud in China is illustrated by surprising article about fake wine in China which addresses the problem of speaking out:

In January, 2019, **Jim Boyce** investigates China's reluctance to stop fake wine.
Posted Wednesday, 23-Jan-2019

Say "fake wine" and "China" and visions of global brands dance in people's heads...there is an eclectic range of borrowed names and fonts, colors and castles, from wineries spanning the globe. And that includes Chinese brands.

In 2017, investigators in Shaanxi province found dodgy wine..., a raid in Henan province netted more than 50,000 bottles of fake wine.

State-owned media caught the culprits in the act." At some wineries, CCTV reporters found workers filling hundreds of bottles with bogus wine under the very surveillance cameras supposed to be connected to the country's quality watchdog agency," reported Shanghai Daily. More than 2 million bottles per year were estimated to be made across numerous operations.

A burning question is why isn't the industry doing more to stop this, especially as food safety is a serious issue in [China](#), with the authorities willing to take action and the media willing to report it?

"Many wineries are worried about the publicity," said one wine trade observer. "Nobody is willing to break the first glass."

In the UK, honey samples were pulled at retail and tested using traditional methods of honey analysis for sweeteners. It was observed that 45% of the samples were out of the HMF range, all samples contained pollen however none had typical honey taste characteristics, and 55% contained a marker for bio-engineered sweeteners. Some of these samples will be tested by NMR.

Adulterated honey that was found on shelves of major Australian retailers was found to be a blend of imported and Australian honey, and the apparent adulteration discovered by NMR was judged to be a result of the Chinese component. As noted previously, the Australian honey company Capilano has been subject to a takeover by Chinese ownership at an acquisition price of \$250 million. The wife of the Chinese president of the company working to acquire Capilano is the daughter of the former Australian Prime Minister. Politics and economics are tightly woven like the strands of an intricate Persian carpet. Foreign acquisitions and honey adulteration are concerns haunting many markets.

There have been numerous reports in the Chinese press of adulterated honey found in supermarkets in major Chinese cities. Chinese consumers are demanding authenticity and traceability, often through mobile phone apps.

The market manipulation which has caused a devaluation of honey prices cannot continue as the world becomes increasingly informed about the phenomenon of adulteration and the

modes of illicit honey production. There will be efforts, some already begun in Asia, to produce and export authentic honey. That transition is an imperative for the survival of beekeepers in the developing world and their continuing access to mature markets in the developed world.

It has been said that the greatest problem facing the global bee population is the low price of honey. The low price of honey is in turn a consequence of the competition between authentic honey and adulterated honey.

By February, 2019, the prices of honey from the Asian exporters plunged another 15% to unprecedented low levels. Beekeepers in those countries are also suffering non-remunerative prices which cannot cover their costs. The current situation favors the few but harms the strategic interests of beekeepers in both the developed and the developing world.

Legitimate standards for authentic honey pertain to all honey, whether that honey is sold to the retail, industrial and or food service industries. There can be no great distinction regarding the question of purity based upon the way honey is consumed.

The proposal that “industrial honey” can be “imitation honey” negates the marketing caché of “honey.” If that caché is to be employed for marketing and economic gain, the product must be a product of nature, not the result of “Food Fraud” or “Economically Motivated Adulteration.”

Macro-economics, Geopolitics and Climate

The international financial market has been saddled with unprecedented debt. The US national debt has risen to over \$21 trillion. Many other countries have debt levels that have deeply weakened both their currencies and economies. The interplay of national and international debt with currency fluctuation has affected the international market and will continue to do so unless and until that debt is reduced. The economic climate of trade wars has created global tensions and increased geo-political conflicts.

To these macro concerns is added the phenomenon of climate change, which evidence indicates has increased the frequency, intensity and volatility of severe weather events. Among these attributes, the most difficult for global agriculture to deal with is increased volatility of severe weather.

In early 2019, arctic vortexes descend upon the U.S. Midwest, causing the greatest one day change in temperatures ever recorded. Concurrently, in the southern hemisphere in Australia, forest fires and extreme heat are reported.

Four of the past five years have been the hottest on record; 18 of the past 19 years have constituted the hottest 2two decades for global average temperatures. The seas are rising, the forests are burning, and the glaciers are melting. It has been written: “This is weather in the age

of extremes. It comes on top of multiple extremes, all kinds in all places.” Prof. C.A. Koalden at the University of Idaho has said, “When something happens, whether it is a cold snap, a wildfire, or a hurricane, we need to think beyond what we have seen in the past and assume there is a high probability it will be worse than anything you have ever seen.” Prof. Wallace Broecker of Columbia University’s famous Lamont Doherty Earth Observatory prophetically warned about these changes 44 years ago.

This past year, heat records were toppled from Norway to Algeria. In, Australia a drought has gone on so long that a child in kindergarten will hardly have seen rain in her lifetime. California’s major utility, PGE, filed for bankruptcy as a consequence of the enormous liabilities that have resulted from 2018’s unprecedented wildfires. The economic consequences of global climate change are incalculable. How climate change will affect the global honey crops of 2019 is a question for which the beginning of 2019 provides an ominous omen.

Conclusion

The World Honey Congress, Apimondia, to be held in Montreal in September 8-12, 2019, will include sections including: 1) Honey Adulteration; 2) The International Honey Market; and 3) The Creative Marketing of Honey.

The international media and the scientific and legal communities concerned with food fraud, customs fraud, label fraud and food adulteration will be interested in this especially important Congress which will also be attended by North American and European authorities.

The present situation is one in which there are no ceilings to quantity and no floors to prices for adulterated honey. This dire situation has come about through complex networks of collusion which put at risk American beekeepers, jeopardizing the incentive to produce honey, and therefore, imperil overall food production. This in turn has negative implications for broader issues including global food security, food authenticity and safety, and ecological sustainability.

Vigorous and vibrant beekeeping communities are essential to the production of a very large quantity of the food supply, which includes foods which provide antioxidants and phytochemicals such as fruits, nuts, seeds and vegetables which play a vital role in a healthy diet and preventative medicine.

The circle must be completed and the international honey industry must develop greater awareness of the illicit modes of production and sophisticated modes of adulteration which have created the collapse in the market and the existential dilemma facing the American and international beekeeping communities. The completion of the circle means implementation of the most sophisticated means of detection of adulteration, including ever-shifting patterns to

evade detection of fraud. A healthy future for beekeepers must be based on a foundation of authentic honey.

Bio

Ron Phipps is Vice President of the Apimondia Scientific Commission on Beekeeping Economy and President of CPNA International, Ltd. He served as personal research assistant to the President of the American Philosophical Association and his academic work was in the philosophy of theoretical physics. He serves as President of Chamber Players International and recently spoke on Integral Ecology at the Parliament of the World's Religions.

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