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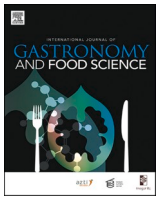

Are pineapples really delicious? The history of the pineapple's taste/flavour and the role of varietal and terroir

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ABSTRACT

The pineapple has long been described as the most delicious of fruits. At the same time, however, the English philosopher John Locke once famously argued that it was impossible to describe the taste of this exotic fruit for those (including himself) who had not had the pleasure of sampling one. In recent years, flavour chemists have managed to identify many of the key volatiles giving rise to the distinctive taste/flavour/aroma of this member of the bromeliad family. However, taking a closer look at the history of this most exotic of fruits soon highlights how 'deliciousness' is very much a culturally and not merely a chemically-determined construct, contrary to what the molecular gastronomists would have us believe. However, beyond sociocultural factors, it should also be remembered how any given pineapple's flavour profile will likely be influenced by a wide array of factors, including those related to varietal, maturity, storage, etc. This makes any attempt to describe the taste/flavour, or to reconstruct the historical aroma/taste of a pineapple in Locke's day (i.e., in the closing decades of the 17th century), all the more challenging.

1. Introduction

For centuries, the pineapple has been considered *the* most delicious of fruits. In fact, dating back to the early writings of the English philosopher John Locke, there has been interest in the taste of this exotic fruit (Locke, 1960). In 1689, Locke published his *Essay Concerning Human Understanding* in which he discusses the impossibility of describing the taste for those who had never had the luxury of tasting one.[1] Contemporary flavour chemistry (Pickenhagen, 1999) has successfully identified a wide range of volatile aromas and sapid compounds that are responsible for distinctive the taste/flavour of the various pineapple cultivars that are grown nowadays (Samuels, 1970; Zhao and Shen, 1978). There are, however, a number of factors making any attempt to describe what those early pineapples might have tasted like for those who were lucky enough to have been offered the fruit when the first specimens were brought back (to Europe) from the Indies in 1661 a particularly challenging exercise (Evelyn, 1827).[2] The pineapple is also an interesting fruit from the point of view of the study of deliciousness, given that it was once so frequently mentioned in this regard in historical records (e.g., Taylor, 1769).[3] In fact, according to certain commentators, the pineapple was 'the most celebrated exotic new taste of the early modern' (Shapin, 2011, p. 24).

The pineapple (Ananas comosus [L.] Merrill) is the only (terrestrial) member of the *Bromeliaceae* family to produce a commercially important fruit. The pineapple, together with other members of the genus Ananas, are distinguishable from other genera in the family on the basis of fruit morphology, and from the closely-related genus Pseudananas by the presence of a crown of conspicuous bracts at the top of the fruit (that

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[1] Note that we can not only make sensory judgments about taste but also analytic, hedonic, and descriptive evaluations (see Spence and Wang, 2015). Here it is important to distinguish between the physiologically-determined sensory discriminative aspects of taste perception and the more hedonic aspects, with deliciousness seeming more related to the hedonic aspects of taste/flavour perception.

[2] Though it should be noted that according to the diarist Evelyn, Oliver Cromwell may have been gifted a pineapple four years earlier. In his journal entry for August 9th, 1661, Evelyn—while recording his own first sighting of "ye famous Queen Pine brought from Barbados," in the presence of the king—suggests that Oliver Cromwell, then the lord protector, had received a similar gift four years earlier (see Evelyn, 1827, Vol. 2, pp. 174–175).

[3] Tryon (1684, p. 6) talks of the pineapple's "excellent Taste, pleasant Smell, and curious Shapes".

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help to capture rain water). For many years, the most important pineapple cultivar commercially has been the Smooth Cayenne.[4] However, in recent years, this varietal has been superseded by the Gold cultivar (otherwise known as MD2; Žemlička et al., 2013). Analysis of Ancient Mesoamerican languages suggests that the pineapple was already a significant crop 2,500 years ago, and traded on a continental scale more than 3,000 years ago. It has been suggested that wild and cultivated pineapples may have diverged between 6,000 and 10,000 years ago (see Aradhya et al., 1994; Clement, Cristo-Araújo, Coppens d'Eeckenbrugge, Pereira and Picanço-Rodrigues, 2010).

There are currently more than 100 pineapple cultivars worldwide. They can be divided into five categories/groups according to their economic characters: the Cayenne, Queen, Spanish, Abacaxi, and Maipure, with each varietal having its own more-or-less unique set of sensory characteristics (e.g., Bartolome et al., 1995; Collins, 1949, 1960; Liu et al., 2008; Soler et al., 2006; Zhang, Du, Sun, Liu, Wei, Liu and Xie, 2009a; Zheng et al., 2012; see Table 1 for a summary of some of the main volatile compounds that have been identified in various pineapple cultivars).[5] Other commercially-grown pineapple cultivars include: Abacaxi, Queen, Red Spanish, Pernambuco, Mordilona, Kona Sugarloaf, Brecheche, Singapore Red, and Panare (see also Loison-Cabot, 1992). According to Coppens d'Eeckenbrugge et al. (1997), the most economically valuable traditional pineapple cultivars worldwide are the 'Cayenne', 'Singapore Spanish', and 'Queen', while the 'Red Spanish', 'Perola', and 'Manzana' varieties tend to be grown locally in their native markets. The Smooth Cayenne became the most important cultivar due to its high yield potential as well as its good fresh fruit processing characteristics, and has dominated the industry since the 1880s (Beauman, 2005, p. 247).

2. On the cultural history of the pineapple

The first exposure of those (Europeans) living in the old world to the pineapple was when the Italian explorer Christopher Columbus (and his crew) landed on the island of Guadeloupe on his second voyage to the New World on November 4th, 1493 (Collins, 1949; Coppens d'Eeckenbrugge et al., 1997). The pineapple was described as: "Fruits like artichoke, four times as tall, fruit in the shape of a pine cone, twice as big, fruit is excellent and can be cut with a knife like a turnip and it seems to be wholesome." (Joy and Anjana, 2016. p. 1). And, according to Collins (1948, p. 372): "the flavour and fragrance of which astonished and delighted them." A century later, pineapples were seen growing in China (in 1594; see Joy and Anjana, 2016). So expensive and desirable was the pineapple in England that they would sometimes be hired for display at prestigious banquets (e.g., Beauman, 2005; O'Hagan, 2020). The pineapple's luxury status and desirability during the 18th and 19th centuries helps to make sense of its widespread appearance as a decorative motive in everything from gate posts to wallpaper (e.g., Beauman, 2005; Gohmann, 2018). However, over the last couple of centuries, the pineapple has become much more widely available. The introduction of steamships in the early decades of the 19th century allowed for the more rapid and regular transportation of the fruit from the Caribbean (i.e., from Barbados and the West Indies) to the United Kingdom, thus ensuring that more of the cargo arrived in a satisfactory state for market (Beauman, 2005; see also Coppens d'Eeckenbrugge et al., 1997).

Table 1
Summary of the main volatile compounds identified in various pineapple cultivars. [Adapted and extended from Mohd Ali et al. (2020), Table 3].

Cultivar (Reference)	Relative amount	Cultivar (Reference)	Relative amount
Main volatile compounds	(μg/kg)	Main volatile compounds	(μg/kg)
Ananas comosus [L.] Merr. (Umano et al., 1992)		**Tainong No. 6 (Zheng et al., 2012)**	
Ethyl 3-acetoxypentanoate	NA	3-(Methylthio)propanoic acid ethyl ester	78
Ethyl 2-hydroxyhexanoate	NA	3-(Methylthio)propanoic acid methyl ester	33
Ethyl 2-hydroxy-3-methylbutanoate	NA	Octanoic acid, ethyl ester	46
Ethyl 4-acetoxypentanoate	NA	Butanoic acid, 2-methyl-, ethyl ester	22
Ethyl 3-hydroxypentanoate	NA	Octanoic acid, methyl ester	21
Gold (Montero-Calderón et al., 2010c)		**Red Spanish (Pino, 2013)**	
Methyl butanoate	2435	Ethyl acetate	5000
Methyl 2-methylbutanoate	2105	3-Methylbutan-1-ol	300
Methyl hexanoate	1163	Methyl 3-(methylthio) propanoate	180
Methyl 2-methylpropanoate	383	Ethyl octanoate	192
Ethyl hexanoate	101	2-Methylpropyl acetate	66
Gold (Montero-Calderón et al., 2010a)		**Shenwan (Wei et al., 2014)**	
Methyl butanoate	2902	Methyl octanoate	327
Methyl 2-methyl butanoate	2427	Methyl decanoate	130
Methyl hexanoate	1204	Methyl hexanoate	100
Methyl 2-methyl propanoate	571	Octanoic acid isopropyl ester	19
Ethyl hexanoate	129		
Methyl 3-(methylthio) propanoate	623		
Smooth Cayenne (Wei et al., 2011a)		**MD2 (Steingass et al., 2014)**	
Ethyl hexanoate	106	Methyl butanoate	990
Ethyl 3-(methylthio) propanoate	91	Ethyl butanoate	1035
Ethyl nonanoate	60	Ethyl 2-methylbutanoate	1050
Methyl 3-(methylthio) propanoate	27	Ethyl hexanoate	1233
Methyl hexanoate	25	Methyl 3-hydroxybutanoate	1478
Tainong 17 (Wei et al., 2011b)		**MD2 (Steingass et al., 2016)**	
Hexanoic acid, methyl ester	28	Ethyl acetate	890
Butanoic acid, 2-methyl-, methyl ester	19	Methyl (E)-2-butenoate	1107
Butanoic acid, methyl ester	13	Methyl 2-hydroxyhexanoate	1575
Octanoic acid, methyl ester	14	Methyl 5-acetoxyhexanoate	1769
		Dimethyl propanedioate	1507
Smooth Cayenne (Kaewtathip and Charoenrein, 2012)		**Morris (Lasekan and Hussein, 2018)**	
Methyl 3-acetoxyhexanoate	277	Methyl-2-methylbutanoate	103
Methyl 3-methylthiopropanoate	127	Methyl-2-methyl acetoacetate	156
Methyl 5-acetoxyhexanoate	118	Methyl hexanoate	397
Methyl octanoate	64	Methyl-3-(methylthiol)-propanoate	307
Methyl hexanoate	39	Methyl-3-hydroxy-4-methyl-pentanoate	65
Ethyl hexanoate	20		

[4] According to Collins (1949), the Cayenne variety probably originated early in 1800, although its name does not appear in the literature until it is mentioned as a hot-house variety in England in 1841 (*Gardeners' Chronicle*, **March 6**th). Given that the leaves of this variety are almost spineless, it is generally called the "Smooth Cayenne".

[5] For instance, when Zhang et al. (2009a) compared Bali, Cayenne, and Tainung 11 pineapple varieties, they documented 11 aromatic components that were common to all three varieties as well as 16, 16, and 7 aromatic components, respectively, that were unique.

2.1. The taste of luxury and deliciousness

Ever since their first arrival in England in the latter half of the 17th century (when tasted by King James in 1661),[6] pineapples have been described as the most delicious of tropical fruits (e.g., Tryon, 1684, p. 4). For example, just take the eighteenth-century garden historian Adam Taylor, who once wrote that: "The Ananas or Pineapple, in Deliciousness of Taste and exquisite Flavour, so far exceeds all other Fruits" (Taylor, 1769, 4, 16n.). Meanwhile, Thomas Hale (1757, p. 231) writes: "No plant is more regarded, or deserves it more than [the pineapple]. The Singularity of the Fruit would not fail to recommend it to the Curious, did not its delicious Taste absorb all other Merit; rendering it the Delight of our Tables … The Superiority of this Fruit over all others, in Taste and Excellence, has made it the great Article of polite Gardening."

In part, of course, this exotic fruit's deliciousness was tied to its phenomenal sweetness (this, at a time when sugar was still an expensive luxury; see Beauman, 2005, p. 27; Mintz, 1985, 2005). That said, some early commentators were also impressed by what they perceived to be a particularly harmonious balance of sweet and sour tastes that the fruit presented to the palate (Tryon, 1684).[7] Given the prominent role of this delicious fruit in English-speaking cultural history, it is therefore somewhat surprising to find that Dunn and Sanchez (2021), in their book on deliciousness, make no mention of this exotic tropical fruit.[8] While the authors' focus (as biologist and anthropologist, respectively) is primarily on the role of deliciousness in evolution, they do mention Brillat-Savarin (1835) volume *The philosopher in the kitchen/The physiology of taste*, as well as Kikunae Ikeda's discovery of umami in 1907 (see Ikeda, 2002). As Collins (1949, p. 372) notes, the pineapple fruit has been "selected, developed, and domesticated by peoples of prehistoric times and passed on to us through one or more earlier civilizations." (see also Pickersgill, 2007).

2.2. The pineapple goes downmarket

By 1850, slices of fresh pineapple were being sold on streets of London for all and sundry to buy (Beauman, 2005, p. 177; Mayhew, 1851, pp. 79–86).[9] Highlighting the rapid change in status of the fruit, Mrs. Beeton's (1861) *Book of Household Management* also included a few recipes that featured pineapple. Although canning technology had been developed in the closing decades of the 19th century (in Hawaii and Malay(si)a), with the first commercial pack of almost 2,000 cases of canned pineapple in 1903 (Auchter, 1951; Beauman, 2005), tinned pineapple became more and more popular in UK households as the years went by (Beauman (2005). Recipes for the hugely popular pineapple upside-down cake first started appearing in the States in the 1920s.[10] That said, Ray Kroc's attempts to introduce a 'Hulaburger', a grilled slice of pineapple placed on a toasted bun between two piece of cheese was not a success, when he introduced it onto the menu in the early days of McDonalds (see Ritzer, 1993, p. 32). Meanwhile, Sam Panopoulos, a Greek who emigrated to Canada, is credited with being the first to put pineapple pieces on pizza back in 1963. He was credited with being the creator the Hawaiian pizza, perhaps Canada's best-known contribution to fusion cuisine (see Johnston, 2017; Spence, 2018)! Though, as Beauman (2005, p. 244) notes, Panopoulos's creation should probably really have been called the Philippine or Thailand pizza given these were the largest growers at the time. Following the mealybug wilt blight that threatened to decimate Hawaii's pineapple crops, which were primarily of the Cayenne variety, in 1926, Del Monte and Dole both established plantations in the Philippines. While 85% of world's canned pineapple still originated in Hawaii in 1947 (Collins, 1949), the top 10 pineapple producers nowadays are Thailand, the Philippines, China, Brazil, India, Nigeria, Costa Rica, Mexico, Indonesia, and Kenya, with their production accounts for approximately 73% of the global total pineapple output (Li et al., 2022; see also FAO, 2022; Jaji et al., 2018; Joy and Anjana, 2016; Loeillet et al., 2011; Shoda, 2011).

The changing status of the pineapple was effectively highlighted in Mike Leigh's 1977 play, Abigail's Party when Beverley, one of the principal characters, tries to assert her sophistication at a dinner party by offering the guests pineapple and cheese on cocktail sticks (see Beauman, 2005, pp. 242–243). As she puts it: "Now then, Sue, let's see … would you like a little cheesy-pineapple one?" As a child growing up in the North of England in the 1970s, a popular dish in pubs was gammon and pineapple (a tinned slice) with chips and an optional fried egg. (According to Beauman, 2005, p. 237, this dish rose to popularity amongst British housewives in the 1950s.) It certainly never occurred to your author to describe this hearty meal as being especially delicious, even if the combination of ingredients can be seen as making sense both in terms of the pineapple's sweetness cutting through the saltiness of the ham, while the bromelain (a protein-digesting enzyme) in raw pineapple helps to tenderize and marinate meat (see Ha et al., 2012).

Perhaps unsurprisingly, given its demise during the latter half of the 20th Century, it is hard to find anyone nowadays who would seemingly still want to single out the pineapple as having an especially delicious taste.[11] This observation then raises the intriguing question of whether the pineapple's taste, flavour, and/or fragrance are the same as they once were, but our response/reaction has changed or whether instead, just like so many other fruits, they simply taste different nowadays, perhaps as a result of selective breeding for appearance and robustness, rather than necessarily for flavour (see Mirsky, 2013)?

3. Locke – on the impossibility of describing the taste of a pineapple

Writing in 1671 (see Nidditch et al., 1990; I. 170), the philosopher, John Locke famously argued that it was impossible to describe the taste of pineapple in words to someone, who like himself (and, for that matter, the vast majority of his early readers), had never tasted one.[12] Here's how Locke puts it: "Ideas [are] conveyd to the minde noe other way but by the senses themselves. nor can all the words in the world—which is very observable—produce in a mans minde one new simple Idea unlesse it be of the sound its self. for I demand whether after all the descriptions a traveller can give of the tast of that delicious fruit cald a pine apple a man who hath never had any of it in his mouth hath any Idea of it or noe? or whether if he thinkes he have, it be any new Idea but rather be not either—some one old Idea or a composition of such severall old Ideas of those tasts which he is told have some resemblance—to the tast of a Pine apple, which Ideas were before produced in his minde by other sensible objects."

Locke's (1960, p. 309) pronouncement has been rephrased as:

[6] King Ferdinand of Spain is recorded eating a pineapple in 1530 (Joy and Anjana, 2016). In contrast, when Emperor Charles V was first offered a pineapple, he though the fruit looked very pretty but refused to taste it (Von Humboldt, 1808).

[7] Richard Ligon (1657, pp. 82–84) writes: "when it comes to be eaten, nothing of rare taste can be thought on that is not there; nor is it imaginable, that so full a Harmony of tastes can be raised, out of so many parts, and all distinguishable." Ligon also mentions the pineapple's sweet scent.

[8] Interestingly, Colin Spencer (2003) in his *British food: An extraordinary thousand years of history* also fails to mention the pineapple, as does Tannahill (1973).

[9] One might, I suppose, consider it an early form of street food.

[10] Pineapple, in the form of pineapple cake, likely has very different associations for those from cross-culturally (Lu et al., 2015).

[11] Intriguingly, Tryon (1684, p. 6) suggests eating pineapple either by itself or else with bread.

[12] Note that although the *Essay Concerning Human Understanding* wasn't published until 1689, the passage containing the pineapple was composed in 1671, following a discussion with several members of the Royal Society (see Evelyn, 1827, Vol. 2, pp. 174–175).

"Simple ideas … are only to be got by those impressions objects themselves make on our minds, by the proper inlets appointed to each sort. If they are not received this way, all the words in the world, made use of to explain or define any of their names, will never be able to produce in us the idea it stands for. … He that thinks otherwise, let him try if any words can give him the taste of a pine apple, and make him have the true idea of the relish of that celebrated delicious fruit. So far as he is told it has a resemblance with any tastes whereof he has the ideas already in his memory, imprinted there by sensible objects, not strangers to his palate, so far may he approach that resemblance in his mind. But this is not giving us that idea by a definition, but exciting in us other simple ideas by their known names; which will be still very different from the true taste of that fruit itself."[13]

There is, in fact, no record of whether Locke, who died on October 28th, 1704, ever encountered a pineapple.[14] However, one for Locke's colleagues at the Royal Society, diarist, and amateur botanist John Evelyn provided what is thought to be the first written description of a pineapple tasted on English soil. On August 14th, 1668 (i.e., three years before Locke began writing his *Essay*), Evelyn describes: "Standing by his Majestie at dinner in the Presence, There was of that rare fruite called the *King- Pine,* (growing in *Barbados* & W. Indies), the first of them I had ever seen; His Majestie having cut it up, was pleased to give me a piece off his owne plate to tast of, but in my opinion it falls short of those ravishing varieties of richness deliciousnesses, describ'd in *Cap: Liggons* history & others; but possibly it might be, (& certainly was) much impaired in coming so farr: It has yet a grateful acidity, but tasts more of the Quince and Melon, than of any other fruite he mentions." (Evelyn, 1827*,* 2, p. 304).

Other early commentators described the pineapple as tasting like a variety of other fruits and products. So, for example. Parkinson wrote in 1640 that the pineapple "tasting like as if Wine, Rosewater and Sugar were mixed together" (Parkinson, 1640). Christopher De Rochefort (1666, p. 58) compared the taste of the pineapple to, all that is "most delicate in the Peach, the Strawberry, the Muscadine-grape, and the Pippin" (de Rochefort, 1658).

In the late seventeenth century, Thomas Tryon wrote that: "THis incomparable *Fruit* deservedly claims precedency for its delicacy and excellency; for when full Ripe, its Taste is so exquisitly delightful and pleasant, that it seems to exceed all others that the Earth produces; whence 'tis reported, that when some of them, by great care, and the favour of a speedy Voyage, were brought into *England,* (for very rarely can they be preserv'd so long) and presented to King *Iames,* he was so ravisht with its charming deliciousness, that he said, *It was not fit to be tasted by a Subject, but only proper to Regale the Gusto of Princes, inured to the highest Delicacies.* The four grand Qualities, whence all per|fect Tastes do proceed, *viz.* the *Astringent* or *Saltish,* the *Bitter,* the *Sweet* and the *Sour* are herein so equally mixt and compounded by Gods Hand-maid (Nature) that 'tis hard to distinguish which of them does predominate; but the truth is, the most delightful Moderator and King of all Tastes, *viz.* the *Sweet* doth a little exceed all the other three, so that there is nothing appears but an inviting Beauty, delightful Redolency, and ravishing Taste, that feasts in the highest degree, all those Senses at once." (Tryon, 1684, pp. 4–5). He continues that: "all the various and numberless Tastes of things, both in the Animal, Vegetable, and Mineral Kingdoms do all proceed and arise from the four grand Qualities aforesaid, … so that there are but four perfect Tastes, they being the Radix of all others …; and according to the Equality of those four, or the weakness or predominancy of each, such a Taste [i.e., one in which the four perfect tastes were in balance] does carry the upper dominion in all things, and accordingly is the same more or less grateful to the Pallate and Stomach, and homogeneal to the Body." (Tryon, 1684, pp. 5–6).[15] The Jesuit priest, Father Andrew White, aboard the first expedition to settle Maryland in 1684 describes the taste as a cross between wine and strawberries (Hall, 1925, p. 36). In one poem, Philip Morin Freneau (1795, p. 132) writes: "the happy flavoured pine; In which unites the tastes and the juices all Of apple, quince, peach, grape and nectarine."

3.1. Naming the fruit

It is tempting to imagine, given the fruit's English name, that the pineapple may have tasted something like an apple to the first individuals who got to taste this delicious fruit. However, while contemporary flavour chemistry has indeed identified a number of important volatile aromas shared by the pineapple and certain apple varieties (e.g., Lasekan and Hussein, 2018), it turns out that the etymology of the term has a different referent/meaning. The Latin name for the fruit that, in English, is called the pineapple is 'ananas comosus'. The term comes originally from Guarani, meaning 'fragrant and excellent fruit'. On its return to Spain, it was christened the pina, ananas. According to Silver (2008), most languages call the seedless bromeliad native to Brazil the "ananas," from the Peruvian word *Nanas,* first recorded in Thevet's *Singularidades.* In the earliest botanical treatises it is catalogued as *Annanasa sativa,* or *Annanasa comosa.* The pineapple first appeared in English, under the name "ananas", in André Thevet's *Singularidades do França Antarctica* in 1555 (Thevét, 1557), that was translated under the title *The New Found World or Antarckticke* by Thomas Hacket in 1568 (rpt. New York, 1971). Note that, in this, the English were only following the rest of the international community—the Spanish, for example, *piña.* However, in England, the fruit was called variously the King pine, the Queen pine,[16] the 'Pine frytt', 'Pine Frute' Pine Apple, pine-apple, and eventually the pineapple. Just as for the Spanish derivation, the word 'pine' comes from the fruit's resemblance to a pine cone. It is easy to imagine, therefore, that apple might have been the closest/most familiar descriptor for the taste/flavour.[17] However, it actually seems to have been called the "pine" or "pineapple" because of its resemblance to the pinecone—the "apple" of the "pine." However, the tradition of calling this exotic fruit the "King-pine," is strictly English. According to Beauman (2005, p. 43), the nomenclature originates in the medieval English word for pinecone 'pynappel'. That said, it is worth remembering that some of the very earliest wild specimens were apparently no larger than an apple (see Beauman, 2005, p. 10).

4. Describing the taste of the pineapple

In Harold McGee's, *On Food and Cooking*, first published in 1984, there is a section entitled "Pineapple Flavor" (McGee, 2004, p. 384), together with a subsection describing the chemical causes of the flavour of the fruit. McGee starts by quoting the 19th-century English writer Charles Lamb who once described the pineapples as remarkable for the

[13] David Hume gives the same example, writing that: "We cannot form to ourselves a just idea of the taste of a pine-apple, without having actually tasted one" (Hume, 1888, p. 5; see also Thomas Reid, 1973, p. 35).

[14] English gardeners apparently first received pineapple plants from the Netherlands in the year 1719 (Joy and Anjana, 2016). In the 18–19th centuries, rich landowners competed with one another (at great expense) to grow pineapples in their pineries (see Beauman, 2005; Louden, 1822).

[15] One other point to consider here is the way in which pineapple has, at certain points in history, been considered to have medicinal properties (Collins, 1949; De Laszlo and Henshaw, 1954; Rousseau, 1991, p. 193). While the pineapple may not be unusual amongst culinary ingredients (especially herbs and spices in this regard), people are nevertheless still likely to perceive/-consider a foodstuff/flavour somewhat differently in the context of a medicinal, rather than merely just a culinary, usage.

[16] Though note that the King and Queen pines were actually different varietals.

[17] One might also consider it a historic version of the suggestion that any unfamiliar exotic meat (e.g., snake) is described as tasting like chicken (see Staton, 1998). Perhaps the apple was once the go-to fruit flavour for the English.

intensity of their flavour, and the experience of tasting one as "almost too transcendent… a pleasure bordering on pain, from the fierceness and insanity of her relish." (Lamb, 1857).[18] At their best, pineapples are both very sweet and quite tart (from the citric acid), and with a rich aroma provided by a complex mixture of fruity esters, pungent sulphur compounds, essences of vanilla and clove (vanillin, eugenol) and several oxygen-containing carbon rings with caramel and sherry overtones (McGee, 2004, p. 384).[19] McGee (2004, p. 383) also mentions three contributing aroma notes of "meaty, clove, and basil." Indeed, for McGee, the pineapple seems to contain such a plenitude of distinct, and distinctive aromas/flavours that the simple idea of pineapple flavour (which itself is a hybrid of other excellent flavours) overflows into other fruits that have nothing to do with it: strawberry, for example, and such categorical "flavour elements" as "'fruity,'" "caramel, nutty," and "tropical fruit, "exotic,'' musky." (McGee, 2004, p. 275).

In *The flavour thesaurus,* Niki Segnit (2010) categorizes pineapple as 'Fresh Fruity'. She describes the flavour as: "A cocktail all on its own. When properly ripe, pineapples combine an array of juicy fruit flavours with a spicy, boozy, confectionary quality redolent of the fruit's classic partners – vanilla, rum, coconut and caramel." (Segnit, 2010, p. 265). A growing body of contemporary flavour chemistry has helped to establish the presence of a number of specific volatiles at levels above the threshold that are typically associated by sensory panellists with such olfactory notes.

5. Flavour chemistry of the pineapple

5.1. Key aroma compounds giving pineapple its distinctive flavour/aroma

The volatile constituents of pineapple have been studied for more than 60 years. To date, almost 300 volatile compounds have been documented (e.g., Berger, Drawert, Kollmannsberger, & Nitz, 1985; Berger et al., 1983; He et al., 2007; Karg, 1983; Nicholas, 1973; Ohta et al., 1987; Preston et al., 2003; Steingass, Carle and Schmarr, 2015a; Takashi and Katsumi, 2006; Takeoka et al., 1989; Takeoka et al., 1991; Wu et al., 1991). It is, though, important to note that only a few of these contribute to pineapple's distinctive flavour (see Dunkel et al., 2014; see also Nijssen et al., 1996; Tokitomo, 2007; Tokitomo et al., 2005). That is, only a minority of the volatile constituents are odour active, meaning that humans are sensitive to them, and that they are present in pineapple fruit at an above-threshold level (Elss et al., 2005; Ito et al., 2006; Pino, 2013). Pineapple flavour (i.e., involving sapid as well as volatile notes) has also been studied extensively (Berger, 1991; Flath, 1980; Flath and Forrey, 1970; Kishino and Kobayashi, 1981; Montero-Calderón, Rojas-Graü and Martín-Belloso, 2010a, b; Rodin et al., 1965; van Straten and Maarse, 1983). I will return, a little later, to a discussion of the taste of the pineapple.

According to Teai et al. (2001), the major functional families of odorants that give rise to the distinctive aroma of Polynesian pineapple are characterized by an assortment of esters (45%), lactones (12%), acids, phenols, hydocarbons, alcohols, sulphur compounds (10%), and carbonyl compounds. Berger et al. (1985a) identified a couple of minor hydrocarbon compounds, 1-(E,Z)-3,5-undecatriene and 1-(E,Z,Z)-3,5,8-undecatetraene, as being important contributors to the fresh-cut pineapple aroma given their low odour threshold values (Tokitomo et al., 2005). According to Takeoka et al. (1991), ethyl 2-methylbutanoate is the second largest odour contributor (after furaneol) to pineapple aroma (see also Zheng et al., 2012). Meanwhile, Kaewtathip and Charoenrein (2012) suggest that the main characteristic volatile compounds of fresh pineapple are methyl hexanoate, ethyl hexanoate, ethyl 3-methylthiopropanoate, and 1-(E,Z)-3,5-undecatriene.

Coucquyt et al. (2020, p. 240) suggest that: "Pineapple get their distinctive fruity-pineapple scent from two different aroma compounds: esters, in this case methyl 3-methylbutanoate, and hydrocarbons, in the form of (E,Z)-1,3,5-undecatriene and (E,E,Z)-1,3,5,8-undecatetraene (this presumably based on Berger et al., 's 1985 study/results). Pineapple furanone is another key aromatic compound (Rodin et al., 1965) that enhances this tropical fruit's sweet scent with its pineapple and caramellic notes (see also Buttery, 1993)." Later, they continue: "A major component in the aroma profile of pineapples is allyl hexanoate, which is also used to create artificial pineapple flavourings. Other contributing odorants include the caramellic-scented pineapple ketone, plus the fruit esters ethyl 2-methylbutanoate and ethyly 3-(methylthio) propionate, which adds a subtle apple-like nuance to the pineapple's tropical fruit fragrance. In addition to their fruity esters and furanones, fresh pineapples also contain strong rum and coconut notes." (Coucquyt et al., 2020, p. 241).

Intriguingly, Tokitomo et al. (2005) were able to create a synthetic pineapple aroma by combining just 12 odour-active volatiles that was indistinguishable orthonasally from fresh pineapple juice. Key amongst the odorants appeared to be 1-(E,Z)-3,5-Undecatriene which the authors describe as imparting a 'fresh, pineapple-like' note, 4-Hydroxy-2, 5-dimethyl-3(2H)-furanone (HDF; furaneol®; pineapple furanone) 'sweet, pineapple-like' (i.e., caramel-like; see also Pickenhagen et al., 1981; Rodin et al., 1965). Meanwhile, methyl 2-methylbutanoate (an ester) was described as having a 'fruity, apple-like' aroma. Interestingly, vanillin which gives a 'vanilla-like' note was also present, though at a level below the odour threshold (see Spence, 2022a). Other constituents having a 'sweet, coconut-like', and 'coconut-like' note were again detected at sub-threshold levels.[20] The coconut-like aroma often found in pineapple has been attributed to lactones, namely, ϒ-octalactone, δ-octalactone and ϒ-nonalactone (Flath 1980; Tokitomo et al., 2005). It is intriguing here to note that Australian researchers working at the Department of Agriculture in Queensland have developed a new variety, known as the AusFestival pineapple which tastes of coconut (see AFP, 2012; Editorial Staff, 2013).

5.2. Factors affecting the flavour profile of pineapple products

Various factors influence the physicochemical properties and sensory acceptability of pineapples of different varieties and stages of growth/maturity (Bartholomew and Paull, 1986; Bartholomew et al., 2003; George et al., 2016; Siti Rashima, Maizura, Wan Nur Hafzan and Hazzeman, 2019). The way in which pineapples are treated has also been shown to change the fruit's flavour profile (Zhang et al., 2012), while the volatile aroma compounds may be modified as a result of freezing, drying, and thawing the fruit (e.g., Braga et al., 2010; Kaewtathip and Charoenrein, 2012), as well as by post-harvest storage conditions (Paull and Chen, 2003; Techavuthiporn et al., 2017; Yoyponsan et al., 2019).[21]

[18] The full text of Lamb's discussion of the pineapple reads: "He is the best of sapors. Pineapple is great. She is indeed almost too transcendent—a delight, if not sinful, yet so like to sinning, that really a tender-conscienced person would do well to pause—too ravishing for mortal taste, she woundeth and excoriateth the lips that approach her—like lover's kisses, she biteth—she is a pleasure bordering on pain from the fierceness and insanity of her relish—but she stoppeth at the palate—she meddleth not with the appetite—and the coarsest hunger might barter her consistently for a mutton chop." A study of the changing use/meaning of the term 'relish' in relation to foods would seem long overdue. (Lamb, 1857, p. 8; see also Lasekan and Hussein, 2018, p. 1).

[19] Of course, just because a particular volatile is present in the fruit that certainly doesn't mean that it is necessarily present at sufficient levels to be perceptible.

[20] Certain synthesized odorants have also been found to smell powerfully of fresh pineapple, including (semi) conjugated ethyl trienoate (Šiška et al., 2017). Goeke et al. (2002) also describe a synthetic molecule eliciting pineapple's powerful flavour and/or fragrance, along with 'green' and intense galbanum notes.

[21] According to Harry J. Klee: "By and large, the postharvest system is set up to destroy flavour." (Mirsky, 2013, p. 84).

Over the years, a number of researchers have compared the volatile constituents of green and ripened pineapple (Moyle et al., 2005; Steingass, Carle and Schmarr, 2015; Steingass et al., 2014; Steingass, Jutzi, Muller, Carle, & Schmarr, 2015; Umano et al., 1992; Zhang et al., 2009a; Zhang, Du, Sun, Wei, Liu and Xie, 2009b). For instance, Umano and colleagues highlighted a greater concentration of methyl and ethyl thioesters during pineapple maturation than in the ripened fruit.

Different parts of the pineapple and different pineapple products also express different chemical signatures (Elss et al., 2005). According to Wei, Liu, Liu, Lv, Yang, and Sun (2011a), the main volatile compounds of the cayenne pineapple were esters (see also Umano et al., 1992), terpenes, ketones, and aldehydes. What is more, the number and concentration of aroma compounds detected in the pulp of the fruit were higher than those found in core. The characteristic aroma compounds in the pulp were ethyl 2-methylbutanoate, ethyl hexanoate (both esters), 2, 5-dimethyl-4-hydroxy-3(2*H*)-furanone (DMHF; a ketone), decanal (an aldehyde), ethyl 3-(methylthio)propionate, ethyl butanoate (an ester), and ethyl (*E*)-3-hexenoate (another ester).

5.3. Is there a terroir associated with pineapples?

Research in flavour chemistry has revealed that the volatile aroma profile of the pulp of pineapples from French Polynesia differ significantly from those grown elsewhere (Taivini et al., 2001; Teai et al., 2001). The interaction of esters, lactones, and furanoid compounds, together with sulphur compounds are powerful components of the odour the fruit originating from this part of the world. According to analysis of MD2 pineapples from Costa Rica and Puerto Rico reported by Žemlička et al. (2013), esters and furanone-derived compounds play a dominant role in the fruit's aroma. In particular, the most abundant volatiles identified were methyl 2-methylbutanoate and methyl hexanoate.

Umano et al. (1992) argued that certain of the volatile compounds from the pineapples imported from the Philippines that they identified by means of gas chromatography and gas chromatography/mass spectrometry had a distinctly pineapple note. In particular, ethyl 3-acetoxypentanoate, ethyl 2-hydroxyhexanoate, and ethyl 2-hydroxy-3-methylbutanoate were all described as smelling like ripened pineapple, ethyl 4-acetoxypentanoate was described as smelling like pineapple, while ethyl 3-hydroxypentanoate was described as smelling fruity, pineapple-like (see also Akioka, 2008). Brat et al. (2004) conducted a physico-chemical analysis of another pineapple hybrid. Taken together, therefore, the evidence would seem to support the view that pineapples express terroir (Schulbach et al., 2007). The impact of terroir thus adds to a number of other factors meaning that it is unlikely that the pineapples we taste today would necessarily have all that much in common in terms of flavour profile of the first pineapples (from the New World) sampled by those from the Old World, even if one were able to track down the appropriate older variety (i.e., to eliminate the impact of breeding).

In summary, therefore, different combinations of volatile organic compounds are found in different cultivars/varietals (perhaps also influenced by terroir), though the particular odour-extraction technique used may also play some role in explaining the differences between studies (see Mohd Ali et al., 2020). As Žemlička et al. (2013, p. 128) put it, when attempting to analyze and compare pineapple aromas nowadays: "Any deeper comparison of our results with those which have been reported on this topic is difficult. The reason is an enormous variability of raw material, differences in origin, cultivated variety, maturity (Steingass, Langen, Carle and Schmarr, 2015), storage period/-conditions (Soler et al., 2006; Xing et al., 2022), and other pre- and post-harvest parameters which must be taken into account. All these factors may affect quality and quantity of components which create a complex of the natural pineapple aroma."

5.4. Burning acidity and the taste of bromelain

At this point, it should be remembered that the distinctive flavour of the pineapple results not just from the particular combination of volatile organic compounds that it expresses, and which may be experienced first orthonasally, and thereafter retronasally on eating the fruit (see also Lenfant et al., 2009). Early commentators drew attention to the sweetness and burning relish of her bite. The latter sensation is attributable to the high levels of proteolytic enzymes, known as bromelain, enriched with organic acids such as citric, malic, and ascorbic acid (Saradhuldhat and Paull, 2007; Siti Rashima et al., 2019; Zampini et al., 2008). It is the protein-digesting enzyme, bromelain, that is responsible for any oral soreness that one may experience after eating lots of raw pineapple. Bromelain can also be found in raw kiwi and papaya.

According to the latest research from Romli and Murad (2022), the consumption of fresh pineapple may also change taste thresholds due to the bromelain it contains. The latter researchers had participants eat either 50 or 100 gr of fresh pineapple and assessed taste detection and recognition thresholds for the four basic tastes. Intriguingly, while sensitivity to sweetness decreased (meaning sweetness perception was suppressed), sensitivity to bitterness decreased (meaning participants became more sensitive). According to the research, bromelain enters the taste pore where it binds to the TRP protein at the membrane taste cell. This, in turn, triggers the activation of the TRP channel, opening it, and allowing for the flow of cations into the cell. The inflammation of the taste cells caused by bromelain results in irritation signalled by the sensory nerve (Corzo et al., 2012). There are, however, some individual differences to be aware of as far as people's response to/liking for such astringent taste sensations is concerned (Louro, Simões, Castelo, Capela e Silva, Luis, Moreira, & Lamy, 2021).[22]

5.5. Pineapple-like aromas: matching sensory analysis to flavour chemistry

'Smelling like apple' is one of the contemporary descriptors that sensory panels have been reported to come up with when tasked with describing the aroma of a pineapple. For instance, Lasekan and Hussein (2018, p. 1) write that: "The aroma of the pineapples was described by seven sensory terms as sweet, floral, fruity, fresh, green, woody and apple-like." However, a closer look at this study soon reveals that the 10 trained sensory panellists were given a number of key volatiles with labels during training. Hence, the panellists who took part in the study may simply just have been using the labels given to them whenever they detected the associated odorant in the pineapple juice samples that were sniffed orthonasally, rather than necessarily spontaneously choosing those labels for themselves. Table 2 highlights a number of volatile compounds that have been used in pineapple-related sensory analysis research.

There is a very extensive literature in flavour chemistry identifying the relevant volatile organic compounds in those fruits (e.g., the apple) whose flavour has been judged in some ways similar to (or overlapping with) that of the pineapple. There has, for example, been extensive research to identify key apple volatiles (Dixon and Hewett, 2000; Farneti et al., 2015; Guo et al., 2020; Mehinagic et al., 2006; Nie et al., 2006; Song et al., 1997; see also Rowan et al., 1996), as well as those volatiles that are distinctive of muskmelon (Jordan et al., 2001; cf. Engel et al., 1990), another of the flavours early commentators used to describe the pineapple.

Recent research by Guo et al. (2020) revealed seven aroma descriptors (melon, pineapple, banana, apple, strawberry, cut green, and

[22] The English botanist and physician, Hans Sloane, writing in 1707 complained of the pineapple that: "they seem to me not so extremely pleasant, but too sower, setting the Teeth in edge very speedily." (Sloane, 1707, p. 191), perhaps hinting at just such individual differences.

Table 2
Volatile compounds that, when presented in isolation, have been described as smelling (orthonasally) as pineapple-like, apple-like, and strawberry-like (and/or used by sensory panels as reference stimuli in pineapple-related research).

Reference	
Volatile	Sensory descriptor
Berger et al. (1985)	
1-(E,Z)-3,5-undecatriene	Fresh-cut pineapple
1-(E,Z,Z)-3,5,8-undecatetraene	Fresh-cut pineapple
Umano et al. (1992)	
Ethyl 3-acetoxypentanoate	Ripened pineapple
Ethyl 2-hydroxyhexanoate	Ripened pineapple
Ethyl 2-hydroxy-3-methylbutanoate	Ripened pineapple
Ethyl 4-acetoxypentanoate	Pineapple-like
Ethyl 3-hydroxypentanoate	Fruity, pineapple-like
Tokitomo et al. (2005)	
1-(E,Z)-3,5-Undecatriene	Fresh, pineapple-like
4-Hydroxy-2,5-dimethyl-3(2H)-furanone (HDF; furaneol®; pineapple furanone)	Sweet, pineapple-like
Methyl 2-methylbutanoate	Fruity, apple-like
Šiška et al. (2017)	
Synthetic (semi) conjugated ethyl trienoate	Fresh pineapple
Lasekan and Hussein (2018)	
Ethyl isohexanote	Pineapple-like
2,5-dimethyl-4-hydroxy-3(2H)-furanone	Strawberry
Ethyl hexanoate	Fruity
β-damascenone	Floral
Methyl-3 (methylthiol)-propanoate	Apple-like
Hexanal	'Green'
Germacrene	Woody
p-anisaldehyde	Sweet
(E,Z)-3,5-undecatriene	Fresh, pineapple-like
Coucquyt et al. (2020)	
Allyl hexanoate	Artificial pineapple
Ethyl 2-methylbutanoate	Subtle apple-like nuance
Ethyly 3-(methylthio)propionate	Subtle apple-like nuance
Guo et al. (2020)	
Propyl-2-methyl butanoate	Pineapple-like
Hexanol	Pineapple-like
Hexanal	Pineapple-like

hay) in 31 apple juices made from four apple varieties (Starkrimson, Gala, Jonagold, and Fuji) from four regions in China. These aroma descriptors were then linked to specific volatiles. The three volatile compounds that were associated with the descriptive sensory analysis panel detecting a pineapple note in the apple juice were Propyl-2-methyl butanoate, hexanol, and hexanal. It is interesting to note that there are apple varietals that are described as tasting like pineapple, such as the Pit-Maston apple (https://walcotnursery.co.uk/product/pitmaston-pineapple/).[23] As yet, however, it would appear that the key volatile organic compounds giving rise to this apple varietal's pineapple-notes have not been identified/studied.

Meanwhile, 2,5-dimethyl-4-hydroxy-3 (2H)-furanone (furaneol) has been documented in both cultivated and wild strawberries, pineapples, and mangoes (Pickenhagen et al., 1981). According to Slaughter (1999), three closely related 4-hydroxy-3(2H)-furanones are important contributors to the flavour of pineapple, strawberry, raspberry, and tomato. Both methyl and ethyl hexanoate have been reported to be present in pineapple and strawberries (Forney et al., 2000; Kaewtathip and Charoenrein, 2012). And while there does not appear to be data for pineapples, it is interesting to note how there is a 35-fold difference in the quantity of volatiles evolved in different cultivars of ripe strawberry (Forney et al., 2000).

Another plant that tastes like the pineapple is the appropriately-named pineappleweed (scientific name: Matricaria discoidea).[24] The flowers have a chamomile/pineapple aroma when crushed (cf. Orav et al., 1999).[25] It should, though, be noted that this weed doesn't contain bromelain. As such, pineappleweed lacks both the burning acidity and intense sweetness that is such a distinctive feature of the taste of fresh pineapple. Thus, while the plant may smell similar to pineapple (suggesting the presence of shared volatiles), it fails to capture either the burning sensation or sweetness of the flavour of the actual fruit.[26] Here, it is perhaps worth highlighting the fact that there is actually a temporal sequence to many of our flavour experiences (see Cairncross and Sjöström, 1950; Caul, 1957, for early research on flavour analysis), with the evolution of flavour partly linked to chewing that flavour chemists have only recently started to imitate (cf. Farneti et al., 2015; Lenfant et al., 2009). Based on the research outlined in this review, it is noticeable how many of the foods that are described as pineapple-like only manage to capture one sensory facet (i.e., the aroma, or the taste, and/or the burn) of the total multisensory experience.

6. Conclusions

Sensory archaeology has started to take off as a field (Huber et al., 2022) following the sensory turn in the social sciences (e.g., see Bull et al., 2006). As such, it becomes legitimate to question what the pineapple actually tasted of to those from the Old World who were lucky enough to taste one. However, in a very real sense, it is impossible to know quite what this highly perfumed plant of the bromeliad family tasted by John Evelyn in 1661 would actually have tasted like (except in terms of Evelyn's, 1661, description). This is not only because 'taste' is as much a socio-cultural, as chemical, construct (see Silver, 2008; see also Shapin, 2011, 2012), but also because the plant breeding is likely to have delivered a quite different flavour composition to that which would have been available to the lucky few, offered the taste of one of these early imports in mid-17th century England (Beauman, 2005). This conclusion aligns with Beauman's (2005, p. 254) position at the very end of her history of the pineapple, where she concludes: "While our perceptions of the pineapple are partly a cultural construct, this does not entirely explain its astonishingly constant image in the West. Is this the result of its Divine Proportions? Its taste or smell? Or its sheer physical exoticism in comparison to, say, the rotund kiwi or the yielding mango?" As Collins (1949, p. 345) notes: "The Red Spanish is the dominant variety in Florida, Mexico and the West Indies, while Queen is produced commercially in Australia, South Africa and the Malay Peninsula. The last mentioned is probably the oldest named variety of pineapple still in existence, having been noted in 1658 by de Rochefort and by Evelyn in England in 1661. Whether the present Queen variety is the same as that of these early records, we, of course, do not know." Though, if Evelyn's early report is anything to go by, the earliest pineapples tasted on

[23] Interestingly, however, the latter varietal was only identified in the 1800s, arguing that the taste of this apple was compared to the pineapple rather than vice versa.

[24] The plant is also known as wild chamomile, disc mayweed, and rayless mayweed.

[25] Chamomile flower smell like pineapple – with gentle notes of apple, and a honey-like sweetness.

[26] This plant was introduced into the UK during the late 19th century. The plant is native to north-east Asia and may have spread to the UK via North America.

English soil may have been rather disappointing due to delays in transportation.

Nowadays, of course, people often claim that fruits don't taste like they used to (Folta and Klee, 2016; Jones, 2017; Mirsky, 2013; Sutton, 2001). All too often, selective breeding/genetic modification help to improve the visual appearance and durability/resistance to disease, but rarely enhance the perfume/aroma. In the case of pineapple, plant breeding and genetic modification continue to lead to the supremacy of new varieties (Li et al., 2022), that are more resistant to pests, and have a more desirable golden colour on both the inside and out. Over the centuries novel types of pineapple have repeatedly been selected to meet the new demands of the cultivator, thus moving further away genetically, morphologically, physiologically and sensorially from their wild progenitors (Ladizinsky, 2012, p. 7). It is intriguing to note how even the names given to newer cultivars, 'Smooth Cayenne', 'Golden Ripe', and the 'MD-2' pineapples trademarked as Del Monte Gold (introduced 1996, and within months of launch the world's best-selling variety of fresh pineapple, with an 80% share of the market; Beauman, 2005, p. 248), etc., would appear to emphasize the new varietals' feel and visual appearance (Joy and Anjana, 2016), with little mention of its supposedly distinctive perfume.[27]

The evidence suggests that it is our tastes that have changed and, as such, illustrates how the notion of deliciousness is a sociocultural construct. At the same time, however, it is important to distinguish here between the sensory-discriminative and hedonic aspects of taste, with 'delicious' seemingly referencing more the hedonic response to the taste qualities. Clearly, while people's hedonic response to foods/flavours may well largely be a sociocultural construct, nevertheless the chemical composition of the food or flavour is not entirely irrelevant. That is, presumably a taster may need to detect a certain component, chemical, or taste/flavour attribute in a foodstuff in order for a particular hedonic judgment/response to be triggered. The philosopher Barry Smith has frequently drawn out the importance of the chemical composition of what is being tasted when coming discussing the claim from some writers that taste is 'subjective' (e.g., see Smith, 2007, 2017a, b).

Such a suggestion contrasts with the claims made by molecular gastronomists, who sometimes suggest that deliciousness can be explained in terms of the physico-chemical properties of foods (e.g. Barham et al., 2010; see also Spence and Youssef, 2018), or by evolutionary biologists, who argue that deliciousness targets that which is essential for an animal's survival (Dunn and Sanchez, 2021). For instance, at one point Barham and his colleagues write that: *"We take a broad view of Molecular Gastronomy and argue it should be considered as the scientific study of why some food tastes terrible, some is mediocre, some good, and occasionally some absolutely delicious. We want to understand what it is that makes one dish delicious and another not, whether it be the choice of ingredients and how they were grown, the manner in which the food was cooked and presented, or the environment in which it was served. All will play their own roles, and there are valid scientific enquiries to be made to elucidate the extent to which they each affect the final result, but chemistry lies at the heart of all these diverse disciplines."* (Barham et al., 2010, p. 2315).

For those who have not studied chemistry, it can be hard to make sense of this extensive list of volatile chemicals (and of the perceptual similarity, or otherwise, of similar sounding compounds, Spence, 2022b). Ultimately, it is difficult to reconstruct, or imagine, how the pineapple tasted in previous centuries. This task is made all the more challenging because of differences in chemical compounds attributable to varietal and terroir. However, even if we were able to capture (or describe) chemical composition accurately, it would still not provide an answer to the question of historical taste. This is because the sweetness that would have been so prized (due to its rarity/expense) had a completely different meaning (then, as compared to now, when sugar consumption is vilified). Nevertheless probing the changing meaning is interesting for what it tells us about the socio-cultural aspects of the term's meaning and usage, at least over recent centuries.

[27] This contrasting with early descriptions of the fruit where the scent is often emphasized. Take the Mughal Emperor Jahangir writing in his memoirs how, by the 1610s, there were many specimins of the "extremely good-smelling and tasting" fruit. The traveller Peter Mundy, writing a few years later stresses how the pineapple "deserves the first rank for its excellent refreshing taste and smell, senting and tasting (but far transcending) the daintiest melon apple with us" (quoted in Beauman, 2005. p. 32).

Implications for gastronomy

For centuries, the pineapple has been described as the most delicious fruit. This narrative historical review charts the changing descriptions of pineapple's taste/flavour and the role of varietal and terroir. The review highlights how deliciousness, characterized as a hedonic response relating to taste/flavour preference, is best understood as a sociocultural concept rather than something that can be defined chemically (as suggested by molecular gastronomy). What is more, the fact that so many descriptions of what pineapples taste like to those who have tried them exist over the last 500 years or so, allows one to ask intriguing questions about the changing nature of taste/preference, given the widespread breeding and hybridization of fruits for visual appearance, and resistance to disease, rather than necessarily for flavour and scent/aroma. Understanding what determines deliciousness is clearly a crucial issue for contemporary gastronomy.

Declaration of competing interest

The author confirms that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome. I confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. I further confirm that the order of authors listed in the manuscript has been approved by all of the authors. I understand that the Corresponding Author is the sole contact for the Editorial process (including Editorial Manager and direct communications with the office).

Data availability

No data was used for the research described in the article.

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