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'Weeds from the yard': A seasonal salad

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ABSTRACT

'Weeds from the yard' is a seasonal dish that has recently been introduced to the menu at Worton Kitchen Garden (WKG), an organic kitchen garden situated on the outskirts of Oxford. This spring offering was created by the chef to draw the attention of diners to some of the nutritious plants, herbs, and specifically weeds, that surround us but which few people currently consider as a legitimate source of nutrition. The dish, provocatively called 'weeds' rather than 'herbs', connects to the recent growth in the popularity of the foraging movement, as well as to the historical basis of food in Britain (and elsewhere) for the rural poor who would once have regularly foraged from the local hedgerows, woodlands, and fields. The eye appeal of the dish was enhanced by the addition of some colourful seasonal flowers. At the same time, however, it is important to recognize how tasty and aromatic many weeds are (i.e., over-and-above the sustainability angle). Taken together, the hope is that the gastrophysics approach can be used to help reintroduce the public to some of the nutritious plants that surround us via a tasty and visually-attractive dish composed primarily of what are commonly, though not uncontroversially, classed as weeds. Doing so will likely require some work to get consumers to think about weeds in a different way.

1. Introduction

In the early modern period, according to La Cerva (2021), the rural poor living in the English countryside would often have foraged for wild herbs and vegetables from the surrounding hedgerows, woodlands, and fields. They would then have made pottages (i.e., soups or stews) from whatever they found (Shikov et al., 2017). According to La Cerva, this might include wild herbs and vegetables such as white man's foot, broadleaf plantain, sorrel, savory, borage, bugloss, common purslane, and chervil, pea shoots, toadflax, rue, skirret, succory, hyssop, watercress, beach mustard, samphire, and scurvy-grass. At the same time, however, La Cerva goes on to suggest that local knowledge of exactly which hedgerow and woodland herbs and plants were edible (and/or nutritious) may slowly have disappeared after having been passed down from mother to daughter for generations, as wild herbs transformed from common subsistence to something of an aristocratic luxury.¹ During the Enlightenment period, there was a growing interest in both categorizing and using herbs (La Cerva, 2021). In fact, various documents relating to herbs appeared, including in Turner's (1551/1996) A

new herball. Meanwhile, formal recognition of salad as a dish in its own right came with the publication of John Evelyn's (1699/2005) *Acetaria: A discourse of sallats*. There one finds one of the first mentions of celery, therein described as sellary. Some of these herbs would also have been grown in monasteries (as medicinal plants) as well as specimens in botanical gardens. According to researchers at Kew Gardens in Britain, humans are capable of finding sustenance in more than 7000 species of plants, although only 417 are eaten currently (Anon, 2022). As such, it would seem appropriate to try and encourage consumers to broaden their perspective as concerns what is edible (and in the case of a number of weeds, nutrition and tasty/flavourful).

However, succeeding in this regard (meaning encouraging more people to consider weeds as a desirable food source) will likely require a concerted effort by different players (including both chefs and food suppliers) both to highlight some of the culinary and nutritional benefits of weeds (Odhav et al., 2007), along with the facilitation of their availability commercially (given that foraging is unlikely to move beyond a niche activity nowadays), in part as a result of the majority of the population now living in urban areas rather than in the countryside, as was

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E-mail address: charles.spence@psy.ox.ac.uk (C. Spence).¹ When describing one of the dishes at his Michelin-starred restaurant Mugaritz in San Sebastian, Spain chef Andoni noted something similar: "The dish 'Roasted and raw vegetables, wild and cultivated shoots and leaves' ... consists of hundreds of vegetables, leaves and herbs – something nobody would think of trying at home." (Aduriz, 2014, p. 42).<https://doi.org/10.1016/j.ijgfs.2023.100776>

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traditionally the case (La Cerva, 2021). There will also be important theoretical work to do concerning how the opinion of contemporary populations to edible weeds can be changed (Borghini et al., 2020; see also Harris, 1989; Heywood, 1999; Rodrigues et al., 2017), if indeed they can. Already, however, there is evidence that the consumption of a range of wild plants is moving into the world of haute cuisine (Łuczaj, Pieroni, Tardío, Pardo-de-Santayana, Sökand, Svanberg and Kalle, 2012).

2. A selection of wild herbs

Below, we summarize the flavour profile and nutritional benefits of a selection of wild herbs² that are more-or-less commonly available in the British Isles (see Table 1). It should, however, be noted that only a subset of these herbs (and vegetables) would likely be available at any point in the year. In particular, availability is constrained by both location and season. For example, some wild herbs are only found in coastal sites (e.g., samphire), others require wet, marshy, or dry ground (such as parsley, *Petroselinum crispum*).³ In terms of seasonality, some (such as nettles, wild garlic, and Akkoub in the Mediterranean) are only available, or else at their tastiest (e.g., least bitter or woody) in early spring whereas others provide edible material growing throughout the spring and summer months (e.g., sorrel). Gorse flowers, by contrast, would only have been available during the autumn months.

2.1. Dandelion

Dandelion (*Taraxacum officinale*) leaves and flowers are a weedy herb that is nonetheless packed with vitamins and minerals, such as vitamins A, B, C, D, and K, folate, iron, calcium, and potassium (see <https://health.clevelandclinic.org/dandelion-health-benefits/>). Dandelion has been used medicinally since the 10th Century and is considered a diuretic. It has even been suggested that dandelion-derived compounds could be used to help tackle type 2 diabetes (see Wirngo et al., 2016) though, as is normally the case, further clinical research is still needed to understand this plant's potential pharmacological and physiological effects (see also González-Castejón et al., 2012; Sweeney et al., 2005; Williams et al., 1996). Dandelion leaves are bitter, having a spicy kick that is somewhat similar to rocket (arugula). What is more, the leaves tend to become more bitter with age (O'Connell, 2009), meaning that dandelions are at their best in the springtime. Evelyn (1699/2005), writing over 300 years ago, suggests washing leaves in water to reduce their bitterness, though rates dandelion as inferior to succory and endive. A number of researchers have been studying the consumer acceptability of dandelion leaves and flowers (e.g., Kallas, 2003; Kour et al., 2020; Kuusi et al., 1984a,b; Olas, 2022; Opoku et al., 2023; see also Hu and Kitts, 2005).

2.2. Sorrel

Sorrel is a small edible green plant from the *Polygonaceae* family that also includes buckwheat and rhubarb. The leaves have an intense lemony tang (Werner, 2015). The three major varieties of sorrel are broad leaf, French, and red-veined sorrel, though there is also sheep's sorrel and wood sorrel. Broad leaf sorrel has slender, arrow-shaped leaves; French or Buckler leaf sorrel has small, bell-shaped leaves, while red-veined sorrel has a slender, tapered leaf with the red veins throughout. Sorrel begins to appear in the spring and becomes progressively more bitter if the leaves are not picked as the year progresses. However, if the leaves are picked once they appear then the plant will

² The terms herbs and spices are often used interchangeably in the literature (see Spence, 2021).

³ The generic name *Petroselinum* comes from the Greek words, "petra" which means stone or rock and "selinin" means celery.

Table 1

Summary of a number of edible weeds that are found in the United Kingdom, with their Latin name as well as dominant flavour/nutritional properties. Note that which plants are classed as weeds sometimes varies by country.

Common name of weed	Latin name	Nutrition properties of note
Dandelion	<i>Taraxacum officinale</i>	Flavonoids, cinnamic acids, & coumarins; Vitamins A, B, C, D, & K; folate, iron, calcium, & potassium
Sorrel	<i>Hibiscus sabdariffa</i>	Vitamins A & C; Potassium; Anti-microbial
Purslane Pineapple weed (wild chamomile, disc mayweed)	<i>Portulaca oleracea</i> <i>Matricaria</i> <i>matricarioides</i> (Less.); <i>Matricaria discoidea</i>	Omega-3 fatty acids Pineapple-like aroma
Miner's lettuce (Winter purslane)	<i>Montia perfoliata</i> <i>Claytonia perfoliata</i>	Good source of vitamins C & A, & iron
Plantain	<i>Plantago lagopus</i> L.L.	Polyphenolic compounds
Jack by the hedge (Garlic mustard)	<i>Alliaria petiolata</i>	Used for its garlicky aroma
Japanese Knotweed	<i>Reynoutria japonica</i>	Tastes like 'rain'
Lamb's quarters (Goosefoot)	<i>Chenopodium album</i>	Good source of fiber, protein, & vitamins A & C
Chickweed	<i>Stellaria media</i>	Vitamins A, D, B complex, C, rutin; Calcium, potassium, phosphorus, zinc, manganese, sodium, copper, & iron
Clover	<i>Trifolium</i>	Rich in protein, minerals, & carbohydrates
Mallow	<i>Malva</i>	Vitamins A & C; Calcium, magnesium, iron, selenium, & potassium
Wild amaranth	<i>Amaranthus</i>	Vitamin A; β-carotene, zeaxanthin, & lutein
Curly dock	<i>Rumex crispus</i>	Vitamin C, A, B1, & B2; Iron
Violet	<i>Viola sororia</i>	Vitamin C; Calcium, magnesium, β-carotene, & antioxidants
Hairy bittercress	<i>Cardamine hirsuta</i>	Rich source of vitamin C
Scurvy-grass (Spoonwort)	<i>Cochlearia officinalis</i>	Vitamin B, C, K, & A; mineral salts
Wild succory	<i>Cichorium intybus</i>	Garlic-like taste/flavour
Wild garlic	<i>Allium ursinum</i>	Amino acids, protein, flavonoids; Iron, calcium, magnesium, potassium, & zinc
European nettles	<i>Urtica dioica</i>	Aromatic, nutrient-dense; Celery-scented
Alexanders (Alisander; Black lovage; Roman celery)	<i>Smyrniolum olusatrum</i>	Tastes of oyster
Oyster leaf	<i>Mertensia maritima</i> (L.) Gray	Protein, calcium, & magnesium
Gallant soldier (Quickweed)	<i>Galinsoga parviflora</i>	Antibacterial & anti-inflammatory
Borage	<i>Borago officinalis</i> L.L.	Cucumber-like taste
Rue (Common rue)	<i>Ruta graveolens</i>	Strong-smelling leaves, bitter taste

reshoot as fresh as in the Spring. Sorrel thus has a long season, with leaves growing constantly from early spring to late fall. Sorrel is a perennial, fast-growing, and winter-resistant green that contains vitamins A and C, as well as potassium. Sorrel (*Hibiscus sabdariffa*) also has anti-microbial properties (e.g., Christian et al., 2006; Fullerton et al.,

2011).

2.3. Purslane

Purslane weed (*Portulaca oleracea* L.) is a particularly interesting herb/weed given that it is one of the few plant sources of omega-3 fatty acid (an essential nutrient for brain health; Simopoulos, 2004; Simopoulos and Salem Jr., 1986; Waylen et al., 2009); it also has antioxidant attributes (Liu et al., 2000; Uddin et al., 2014). Purslane can thus be considered an important plant, one that is found naturally as a weed in field crops and lawns. Purslane is widely distributed around the globe and is also a popular potherb in Europe, Asia, and the Mediterranean. Purslane, basil, and a kind of fern, were the only three plants that Jean de Léry who landed in Río de Janeiro in the 1550s as part of abortive French colony found that were familiar to him (Crosby Jr, 1973, p. 5).

It is a rich source of potassium (494 mg/100 g), magnesium (68 mg/100 g), and calcium (65 mg/100 g; Mohamed and Hussein, 1994). Some commentators have even gone so far as to argue that it should be considered important in terms of world nutrition (Simopoulos et al., 1995). Certainly, as a significant source of omega-3 oils, purslane weed could potentially yield considerable health benefits to vegetarian and other groups, whose diet excludes the consumption of fish oils (Uddin et al., 2014). Purslane has been described as having a sour, salt-and-peppery taste similar to spinach, and it can be used in much the same way as the more mainstream leafy green.

Winter purslane (*Claytonia perfoliata*), also known as miner's lettuce (Shaw, 2011) got its name because the Gold Rush miners ate it to stave off the disease, which is caused by a Vitamin C deficiency Miner's lettuce was first prescribed by Rev. William Taylor in 1849 during the California gold rush (Purdy, 1912, p. 178; Taylor, 1860, pp. 230–231). To give some sense of the nutritional benefits of this prolific weed - 100 gm, and 33 per cent of the adult U.S. RDA for ascorbic acid, 22 per cent of the vitamin A allowance, and 10 per cent of the iron (Schelstraete and Kennedy, 1980).

2.4. Savory

The genus *Satureja* Linn. (Lamiaceae) comprises about 14 species of highly aromatic, hardy annual or perennial herbs or under-shrubs. Two important species of this genus are *S. hortensis* (summer savory). Summer savory is a hairy aromatic annual and is grown as a popular garden herb. Savory is an herb in its own right, and is related to rosemary, and mint. From casseroles to meats, bean dishes to stews, savory can add a twist of rich, smokey flavour to so many different meals. Summer savory (*Satureja hortensis*) is often paired with lighter foods such as beans, while winter savory (*S. montana*) is cooked with heavier fare, such as meats and stuffings (CSIR, 1972). Both summer and winter savory can help to deepen and enrich the flavors of a wide range of dishes. Summer savory's aroma and flavour is closer to the gentle herbaceousness of both thyme and rosemary, whereas winter savory tends to be a bit harsher and more bitter. According to Eskenazi (2020), it has a very "wintery" flavor profile, with familiar twangs of pine and sage. Winter savory (*S. montana*) is a semi-evergreen bushy and woody perennial shrub, with smaller pink or white flowers and a stronger flavour (Ravindran et al., 2004). Online sources suggest that it can be replaced by thyme, sage, or marjoram in recipes. The savory of commerce is the dried leaves and flowering tops, but the best class comprises only leaves (CSIR, 1972). According to Lawrence (1981), the chemical composition of savory oils from Europe, Canada and North Africa vary in terms of the *p*-cymene, myrcene, and γ -terpinene contents.

2.5. Borage, bugloss, and oysterleaf

Borage (*Borago officinalis* L.) is used as either a fresh vegetable or a dried herb. As a fresh vegetable, borage, with a cucumber-like taste, is often used in salads or as a garnish, while the flower has a sweet, honey-

like taste. Bugloss is the name used for a number of plants in the borage family (*Boraginaceae*). According to the results of a survey in 21 small communes across Italy, borage is still commonly foraged (Ghirardini et al., 2007; see also Hadjichambis et al., 2008).

Another member of the borage family, oyster leaf (*Mertensia maritima* (L.) Gray, also called vegetarian oyster, is a flowering plant that tastes distinctly of oyster. The leaves themselves have only a weak smell, but when scratched, there is first a green, slightly mushroom odour, followed by marine, oyster-like notes (Delort et al., 2012). Furthermore, when eaten, the retronasal aroma is extremely reminiscent of oyster. Analysis of the volatile composition of oyster leaf using gas chromatography–mass spectrometry (GC-MS) has highlighted the presence of four key volatile compounds in the marine-like aroma of the cut leaves, namely (Z)-3-nonenal, (Z)-1,5-octadien-3-ol, (Z,Z)-3,6-nonadienal, and (Z)-1,5-octadien-3-one (Delort et al., 2012).⁴ Oyster leaf is now only found growing naturally on Scottish shore, in Northern England and Ireland. Its population is decreasing and it can no longer be found on much of the English coast. This intriguing herb is, though, grown commercially (e.g., see Koppert Cress; <https://www.koppertcress.com/en/producten/oyster-leaves>).

2.6. Rue

Rue (*Ruta graveolens*),⁵ also known as common rue, or herb-of-grace, is a species of *Ruta* that is grown as an herb. Native to the Balkan Peninsula, it can now be found in gardens around the world, where it is cultivated as a perennial culinary herb. However, although popular in the fourth century book of recipes attributed to Apicius (1936; though see Lindsay, 1997), it would soon appear to have fallen out of favour thereafter (Albala, 2021). This may have been because it was popularly considered as an abortifacient (e.g., Kong et al., 2007).⁶ Rue has a very bitter taste.

2.7. Wild garlic, wild nettles, and plantain (plantago)

Wild garlic (*Allium ursinum*) tastes like garlic, only grassier (Markham, 2022). The succulent young leaves of this springtime herb are often used in leafy salads, though are best cut small (Berrill, 2021). European nettles (*Urtica dioica*) are traditionally eaten in early spring as they are one of the first edible green shoots to appear, known as a "pot-herb". They have also been referred to as the Devil's plant, the Devil's leaf, the burn weed, burn hazel, tanging nettle and bull nettle (Morton, 2020). However, they need to be cooked in order to remove the stinging formic acid. It is interesting to note that historically the use of nettles as food was not confined solely to the countryside. Samuel Pepys recorded that on Monday, February 25, 1661, visiting a friend's house in London, 'there did we eat some nettle porridge, which was made today ... and it was very good'. Meanwhile, John Evelyn's 1699 vol on salads includes four mentions of the use of young nettle tops in recipes (Evelyn, 2005). Isabella Beeton recommended nettles for soup when in season (January–February and April–September), though Beeton, 1861, in her famous cookbook only mentions nettles as preservative of certain foods, such as crayfish and turkey, as well as an animal food). Nettles are also popular in Nepal (Gurung, 2021), and contain calcium, iron, magnesium, chlorophyll, vitamin D and K, as well as amino acids. Today, though, rural cookbooks abound with recipes. Plantago contains a

⁴ On occasion, individual oyster leaves have been presented as a course in the context of modernist dining (Spence and Piqueras-Fiszman, 2014).

⁵ The specific epithet *graveolens* refers to the strong-smelling leaves.

⁶ According to Nelson (2009), in Ancient Greece pennyroyal (*Mentha pulegium* L.) and other medicinal plants were also used as anti-fertility agents (see also Riddle, 1997).

nutritious mix of minerals, fatty acids, vitamin C, carotenes (antioxidants), nitrate, and oxalic acid (Markham, 2022).⁷ It also contains several health-related polyphenolic compounds (Velázquez Fiz, Díaz Lanza and Fernández Matellano, 2000). Once again, the leaves have a bitter taste (Duke, 2001, p. 150).

3. A selection of other edible herbs

Wild succory (*Cichorium intybus*) is a common roadside English plant that can be either white or blue in colour. It belongs to the Composite order, and is also called Turnsole, because it always turns its flowers towards the sun.⁸ It is used in salads, and when it grows larger, the plant is also known as chicory. According to Hugh Fearnley-Whittingstall (2009), chervil tastes mild and subtle, a little like parsley, but with a sophisticated yet gentle, aniseed-like warmth. It is often found in French dishes. Scurvy-grass (*Cochlearia officinalis*), otherwise known as spoonwort is a flowering herb, and is a species of flowering plant in the family Brassicaceae. Its leaves have long been used medicinally, and its name comes from the fact that sailors used to take it to prevent scurvy, a disease caused by not getting enough vitamin C. Scurvy-grass is edible both raw and cooked, with a flavour that is described as similar to cress. Samphire is a name given to a range of succulent salt-tolerant plants (*halophytes*) that tend to be associated with bodies of water. Pine-appleweed (*Matricaria discoidea*), also known as wild chamomile, disc mayweed, and rayless mayweed. The flowers have a chamomile/pineapple aroma when crushed (cf. Orav et al., 1999). The chamomile flower smells like pineapple – with gentle notes of apple, and a honey-like sweetness. There are at least 14 different types of thistle in the UK, and all are edible. Evelyn (1699/2005) includes several mentions of how to prepare thistle, and suggests that they are at their best in May, in England.

Markham (2022) has helpfully highlighted a number of other edible weeds/herbs: including Clover (*Trifolium*); Lamb's quarters (*Chenopodium album*); Chickweed (*Stellaria media*); Mallow (*Malva*); Wild amaranth (*Amaranthus*); Curly dock (*Rumex crispus*); Violet (*Viola sororia*); Hairy bittercress (*Cardamine hirsuta*); Garlic mustard (*Alliaria petiolata*); Sourgrass (*Oxalis stricta*), otherwise known as lemon clover; Japanese Knotweed (*Reynoutria japonica*).

Jack by the hedge (Bird, 2015) is a fast-growing member of the Brassicaceae family that appears from early February. There are several types of clover, the most common being red clover (which grows tall) and white clover (which spreads outward). Both are rich in protein, minerals, and carbohydrates. Lamb's quarters, also known as goosefoot, is loaded with fiber, protein, and vitamins A and C, and has a taste that is described as cabbage-like. Hyssop is a herb from the oregano family whose documented use dates back to biblical times though tends to be more common in dry Mediterranean spots (Fleisher and Fleisher, 1988); Skirret (*Sium sisarum* a root vegetable of the Apiaceae family, grown in England since 16th century). Later in the season one has gorse flowers (gorse bushes covered in yellow flowers. While the seeds and pods are poisonous, the flowers are edible, having a taste that is reminiscent of pineapple while smelling of coconut (Boulter, 2020). Other edible plants include toadflax (*Linaria vulgaris*), and three-cornered leek (*Allium triquetrum*), a cross between leek and garlic Bramley (2021). It should, though, be noted that it is an offence under Schedule 9 of the Wildlife and Countryside Act in England and Wales to plant or otherwise cause to grow in the wild this invasive species, brought over to the UK from the Mediterranean.

⁷ Nutritional composition of Plantago species (P. Major L., P. Lanceolata L., and P. Media L.), a very good source of vitamin C (Guil-Guerrero, 2010).

⁸ For the coronation feast of Richard III of England in 1483, 18lbs. of turnsole was needed for a feast for around 1000 people (see Sutton and Hammond, 1983; Woolgar, 2018).

4. Other factors relevant to consumption of herbs

One important factor to consider is the danger of confusing edible with visually-similar poisonous. For instance, wild leeks and lily of the valley look very similar, but the latter is poisonous (Rickard, 2022). 'Fool's parsley' (*Aethusa cynapium*) looks similar to parsley (*Petroselinum crispum*), but is also poisonous. (Punoševac et al., 2021; Sarwar et al., 2016). Meanwhile, chickweed looks very similar to radium weed, a poisonous plant that grows in similar conditions, There is also a danger of inexperienced foragers confusing common hogweed (*Heracleum sphondylium*; which needs to be cooked thoroughly before eating) with giant hogweed (*Heracleum mantegazzianum*; Harford, n.d.-a). *Allium ursinum* L. (wild garlic) is popular, though when not in flower, the leaves may be confused with those of *Colchicum autumnale* L., a toxic plant containing colchicine. Several accidental poisonings caused by the ingestion of Meadow Saffron *C.autumnale* mistaken for Ramsons *A. ursinum* have been documented in the literature (Davanzo et al., 2011). An additional worry specifically in the contemporary era is, of course, that one also needs to be careful that foraged herbs have not been recently sprayed with pesticide or some other toxic chemicals (Markham, 2022). The latter concern is fortunately not a problem at Worton Kitchen Garden where the use of natural pesticides is carefully managed. One other issue to be aware of are the occasional mentions of contact dermatitis that have been reported to result from handling certain species of weed.

5. What are weeds?

Although there is much general agreement as to which plants are weeds, definitions of a weed are almost as numerous as the authors of papers discussing the topic (Baker, 1974; Swink, 1965). (Baker, 1965, p. 147) provided the following definition a decade ago that a plant is a weed "if, in any specified geographical area, its populations grow entirely or predominantly in situations markedly disturbed by man (without, of course, being deliberately cultivated plants)." Intriguingly, Snir, Nadel, Groman-Yaroslavski, Melamed, Sternberg, Bar-Yosef et al. (2015) report evidence of 13 proto-weeds at a 23,000 year old site of fisher-hunter-gatherers' on the shore of the Sea of Galilee (i.e., long before neolithic farming began). Snir et al. suggest that proto-weeds grew in the vicinity of human encampments and most probably also in small scale, cultivated plots of land.⁹

The term 'weed' typically has a much more negative connotation (see Baker, 1974; Harlan and de Wet, 1965; Holm et al., 1977; see also Holm et al., 1997) than alternate descriptors such as wild 'herbs' or 'leafy greens.' Owing to their rapid water uptake (particularly in water-limited habitats), high growth rates, dispersal capabilities, and ability to thrive in areas with altered soil nutrient resources, synanthropic species (later termed weeds) frequently invade newly-formed habitats. A few weeds and invasive plants actually evolved from domestic ancestors (Ellstrand et al., 2010). The latter authors note that while the distinction between weeds and invasive plants is often clear, it is occasionally fuzzy or arbitrary (cf. Alpert et al., 2000).

Two common and also despised weed species (ground elder and Alexanders), are believed to have been introduced by the Romans as food crops (and also known as Roman celery) before being discovered to be aggressive invaders. Ground elder (*Aegopodium podagraria*), is a species of flowering plant in the carrot family *Apiaceae*. Alexanders, or alisander (*Smyrniium olusatrum*) is an edible flowering plant of the family *Apiaceae* (*Umbelliferae*; Randall, 2003; see also Davidson and Jaine, 2006; Lyell, 1911). Evelyn (1699) describes Alexanders as a "moderately hot, and of a cleansing faculty," comparing its taste favourably to

⁹ Following the publication of the book, The Genetics of Colonizing Species (Baker and Stebbins 1965), evolutionary biologists began to focus on how weeds might evolve (e.g., Baker 1974).

parsley. “Ellicksander Pottage” was described by Robert May in *The Accomplish’t Cook* (May, 1660) where the professional cook writes: “Chop ellicksanders and oatmeal together, being picked and washed, then set on a pipkin with fair water, and when it boils, put in your herbs, oatmeal, and salt, and boil it on a soft fire, and make it not too thick, being almost boil’d put in some butter.” Interestingly, both plants have started the path back to food acceptability over the last few years. The former styled as “Italian Spinach” and the young shoots of the latter are sometimes served as an alternative to Asparagus.

Galinsoga parviflora (Asteraceae), otherwise known as gallant soldier is a herb that is commonly found in disturbed habitats and agricultural areas in many parts of the temperate and subtropical regions of the world (Damalas, 2008; Studzińska-Sroka et al., 2018). It is a native of tropical America and it is thought to have originated is thought to be the mountainous areas of Central America. The weed is reported to exhibit antibacterial and anti-inflammatory activities (Matu and Van Staden 2003). It contains protein (c. 4% by weight), calcium, and magnesium, and is used as a culinary herb called ‘guascas’ in Colombia (Facciola, 1990). See also Rolnik et al. (2021) on the nutritional properties of other members of the Asteraceae family of plants.

Relevant here, one might consider only how garlic mustard is a highly invasive weed. Fennel is increasingly seen as an invasive bullying weed – particularly in the dry, sandy soils of East Anglia where it is taking over and towering over the other roadside plants and in central reservations. Fennel (*Foeniculum vulgare*) is considered a weed in California (Bell et al., 2008). Part of the concept of weed, is that the plant is unbeatable (hard to remove/eradicate as well as speedily self-propagating - fennel with its infinite wind spread seeds and almost indestructible deep tap root certainly). Similarly, wild garlic is so abundant in North America that the U.S. Department of Agriculture has classified it a “noxious weed,” (i.e., one that could be harmful to the environment or animals; see Markham, 2022). It is interesting to note that while many of the herbs that would have been foraged in the early middle England have likely been lost, others, such as (Japanese knotweed; *Fallopia Japonica*) have only been introduced over the last century or two. For instance, Japanese knotweed was originally brought to the UK in 1850 by the Victorians, specifically by a German-born botanist named Philip von Siebold. Interestingly, Japanese knotweed is currently in demand amongst many chefs. According to Preston (2016), it can be tart, crunchy, and juicy; can be eaten raw or cooked; and can lean sweet or savoury, depending on how it’s prepared. Note, though, that wild herbs are likely to have a stronger taste/flavour than many modern cultivated plants (see Ghirardini et al., 2007; Turner, 1996).

6. Oxford’s very own contribution to the history of weeds

Oxford has its very own place in the history of weeds. In particular, the introduction of *Senecio squalidus* L. (Asteraceae) to Oxford, from Sicily, in the late 17th century and its subsequent spread through the United Kingdom, via the railway lines, is one of the best-documented introductions (see Abbott and Lowe, 2004; Allan and Pannell, 2009; Druce, 1927a, b). In particular, in the British Isles, Oxford ragwort (*Senecio squalidus*), is a flowering plant in the daisy family Asteraceae. Evidence for the introduction of *S. squalidus* to the Oxford Botanic Garden comes from herbarium and literature records, but despite the conclusions of previous investigators, there is no evidence from dated sources showing that *S. squalidus* was growing in the British Isles prior to 1700 (Kent, 1956). Furthermore, evidence for an initial introduction to Oxford is limited, although if the records cited by George Druce are to be believed then *S. chrysanthemifolius*, rather than *S. squalidus*, was introduced initially. Specimen-based evidence suggests that a more likely initial route for the introduction of *S. squalidus* was via Francisco Cupani and William Sherard (probably between 1700 and 1702), to the Duchess of Beaufort’s garden at Badminton, with a later transfer of material to Oxford Physic Garden before Jacob Bobart’s death in 1719 (Harris, 2002; Vines and Druce, 1914; Walker, 1833). That said, the first

complete account of Oxford plants, published in 1794 by Professor John Sibthorp, failed to recognize the ragwort on the walls as that described by Linnaeus (Sibthorp, 1794).

Oxford ragwort is itself a hybrid of two Italian species; one (*Senecio aethnensis*) that is endemic to the upper parts of Mount Etna, the other (*Senecio chrysanthemifolius*) is widespread in southern Italy. Although the adaptation of this weed in England occurred slowly, the ragwort adapted to Scottish life in fewer than 50 years.¹⁰ Oxford ragwort’s slow migration along the railroad from Oxford (its point of introduction) to London placed in the right place to develop a large population in areas that had been devastated by World War II bombing (which in turn, gave it the “infection pressure” that enabled it to sweep over the British Isles as a weed of roadsides and waste places; see Baker, 1972, for a summary). Nowadays, Oxford ragwort’s distinctive, star-like, yellow inflorescences are a familiar feature of spring and early summer across Britain, wherever well-drained, man-made habitats abound. Unfortunately, though, due to its toxicity to livestock, it is currently an offence to propagate Oxford ragwort, meaning that it is difficult to justify incorporating Oxford’s very own weed on the menu.

7. ‘Weeds from the yard’

The name of the dish was chosen to provoke the curiosity of customers, who order from a daily chalkboard menu (see Spence and Piqueras-Fiszman, 2014). The hope is that customers (or at least a subset of them) will be encouraged to think differently about some of the nutritious and tasty weeds that are all around them (cf. Bansal, 2017). The dish itself ticks a number of currently trending themes including the growth of foraging (Bramley, 2021; Clevely and Richmond, 1999; Knight, 2021; Popkin, 2022; Rickard, 2022), a return to seasonal eating (Puckett, 2022), the reduction in food miles (see <https://www.worldatlas.com/articles/what-is-a-food-mile.html>); though see also Kemp et al., 2010).

The dish is also timely given current shortages of salad in British supermarkets (Sillars, 2023), meaning that a growing number of people are starting to question what they can eat, and where they might find/source it from.¹¹ Seasonal eating may also help to promote healthy eating habits (Macdiarmid, 2014), and the culinary use of herbs is once again becoming more popular (e.g., Diacono, 2021; La Cerva, 2021; see also Lee, 1959; Saladino, 2022).¹² The ‘Weeds from the yard’ dish is served in spring with weeds foraged from the grounds of Worton Kitchen Garden (<https://wortonkitchengarden.com/>). The composition varies through the spring but, in April, includes winter purslane, sorrel, hedge garlic (garlic mustard, jack by the hedge), chickweed, hawthorn leaves,¹³ lovage (see Spence, 2023) and wild garlic. The venue is a

¹⁰ Oxford ragwort is, however, more than merely just a weedy plant that happened to leap a garden wall; it has evolved to become a model plant for studying the evolution of wild plant populations. Although crosses with the native groundsel (*Senecio vulgaris*) produce sterile hybrids, a few, following complex genetic changes, are fertile. In the last 150 years, three of these hybrids have been formally described as new taxa; radiate groundsel (*Senecio vulgaris* var. *hibernicus*), Welsh ragwort (*Senecio cambrensis*) and, most recently, York ragwort (*Senecio eboracensis*).

¹¹ The increase in foraging can also be seen as a response to the Covid pandemic, as people search for calm by reconnecting to nature through all of their senses (Boulter, 2020; Spence, 2020b; see also Franco et al., 2017).

¹² UK chef Ben Spalding created an intriguing salad consisting of a wide variety of different leaves/herbs (see Masters, 2012; O’Loughlin, 2012; see Spence, 2020a). The dish was served to diners in the John Salt restaurant in Islington, North London together with a London Tube Map on which the various stations had been replaced by the names of the various leaves/herbs that the diner might, depending of the season/availability, find in their salad.

¹³ Young leaves and shoots of the common hawthorn are edible, and were once known as “bread and cheese” (Hartford, n.d.-b; see also Miller and Brown, 2021).

largely organic farm with associated restaurant. Crucially, during the spring, the venue is only open for lunch five days a week, thus meaning that supply can meet demand – this is often a concern as far as commercial foraging is concerned. Given that a range of product-intrinsic as well as product-extrinsic visual cues have been shown to influence consumer emotion and purchase intent in the case of ready-to-eat salad (Chonpracha, Ardoin, Gao, Waimaleongora-ek, Tuuri and Prinyawitkul, 2020; Spence, 2020a). It is worth noting that the flowers of plants such as borage, wild rocket, wild garlic and gorse, can be added to help enhance the eye-appeal of the dish (see Spence, 2020a).

One challenge when thinking about the commercialization of weeds as an edible food source concerns the regional differences in which plants are classed as weeds, which as we have seen, can change from one country to the next (e.g., Bell et al., 2008; Markham, 2022). Another important challenge when considering how to encourage consumers to eat more weeds may relate to the need to change people's categorization of weeds, as something of a pest to a desirable, tasty, and potentially also nutritious and cheap source of food (cf. Chen and Wei, 2017; Rodrigues & Spence, submitted).

Ultimately, the hope is that by drawing diners' attention to the range of edible weeds that surround us, it may in some small way be possible to change people's perception of both what is edible and tasty, and thus in some small way, change people's food behaviour in a way that is more sustainably both for the individual and for the plant.

Implications for Gastronomy

'Weeds from the yard' is a seasonal salad that has recently been introduced onto the menu at Worton Kitchen Garden (WKG), an organic garden situated on the outskirts of Oxford. This springtime offering was created by the chef in order to draw people's attention to some of the nutritious and tasty weeds that surround us, but which few consumers currently consider as a legitimate source of nutrition. The dish resonates with the recent growth in the popularity of the foraging movement, as well as with growing concerns around where our food can/is coming from. Although they are often bitter, a number of weeds are both tasty and aromatic. Thus, there would appear to be all the more reason to encourage a return to more traditional patterns of consumption. The hope is that gastrophysics can be used to help reintroduce the public to some of the nutritious plants that surround us via a tasty and visually-attractive dish composed primarily of what are commonly classed as weeds.

Declaration of competing interest

The authors confirm 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. The manuscript has been read and approved by all named authors and there are no other persons who satisfied the criteria for authorship but are not listed. The authors 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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