A few New Zealand plant specialists have turned some weeds into high producing nutritious feed plants of good commercial value to farmers.

Chicory - Puna and Choice (Cichorium intybus L)

Wild chicory is considered a weed in some countries and banned in some USA States. The varieties below are not weeds, and are much higher yielding than the old wild ones.

The improved chicories are very versatile and can be sown in early autumn, but best in spring. They yield well when sown with pasture and frequently grazed brassicas such as Pasja, but not with turnips, swedes, etc., which are grazed only once.

Chicory originated in Central Europe, and was improved by W Rumball and others at New Zealand AgResearch, Grasslands, and is sold as Puna Chicory. There are others that have been developed, such as Choice, and Forager Chicory which is an annual. Sometimes Forager Chicory has been sold as a perennial, so be careful when you buy, don't ask for just Chicory. Forager chicory is a short lived one for growing with spring forage crops rather than on its own. It adds the deep rooting qualities of higher minerals and better feed value to crops such as Nutrifeed, brassicas and millets. Pasja brassica is a much higher yielder and faster regrower. If keen on Chicory as a summer forage crop, add a few kg of Pasja to your spring mix for a higher yield, but it grows only until April.

Puna and Choice (from now on in this chapter, called chicory) are increasing rapidly in popularity. It has been approved for growing in parts of USA where other chicories are noxious. Chicories are frost tender so are best sown in spring. While chicory can be grown with, or as a forage crop, it is not permanent, and is best grown with pasture.

Choice is claimed to have less milk tainting effect, and to last longer. Inquire in your area and do trials, which can be done by oversowing into existing pastures with other seeds if necessary, or on its own. Existing pasture would need grazing short before or after drilling, and be kept below 15 cm (6 inches) until the chicory is established and is above 15 cm.

Results of a trial conducted by Dr. Jerry Jung, a forage specialist at Pennsylvania State University showed high forage yield and feed quality. Chicory produces up to 13 tons of dry matter per hectare from spring to autumn, or 15,000 kg with grasses which extend the paddock's growing season into the cool weather when Puna stops growing completely, and can look to be dead.

Its long tap root makes it very drought tolerant. Chicory is best sown in spring once soil temperatures have warmed, at half a kg per hectare (40 seeds per m2) or half a pound per acre, and at a depth no deeper than half a centimetre or a quarter of an inch. How is that achieved? By fast chisel ploughing a small area to sowing within two days and creating a very firm seedbed and double rolling with a Cambridge roller with a few light branches dragged behind. See Soils > Cultivation.

Chicory grows very well on fertile, well drained soil and a pH of about 5.5 or higher. Stock love it and produce more highly on it than on any other grazed feed. As long as it is not pugged, over-grazed or sprayed out (it is susceptible to all weed sprays) it will last for a few years, getting thinner each year. It can be sown with perennial grasses, but if too thick it can swamp out the grasses. Some vendors of seed can recommend several kg per hectare, which is wrong and costs more and gives lower yields. Some do so to cover their backs in case the seedbed and sowing are rough. See Soils > Cultivation for how firm the paddock should be.

Chicory with its thick stems can be slow to dry, so is not satisfactory to make into hay.

It can be sown with pasture mixes or with forage crops at half a kg per ha (half a lb per a). Reduce the brassica sowing rate by the same amount.

In pastures you might not see any in winter, but in late spring it'll appear and thrive in warm well drained fertile conditions. It'll last only one summer in peat and wet soils.

Puna chicory can also be sown in pastures to give more summer growth. Some farmers have

increased milk by a litre/cow/day when grazing pastures with Puna in them. It can be oversown (overseeded) into existing pastures in spring at 0.75 kg/ha. Try a few hectares broadcast four days before grazing. One kg/ha can end up with too much Puna competing with each other.

It grows well in the summer heat and is loved by stock.

Spraying for weeds, and winter pugging kill it.

What some members have done is after the 3rd graze of the chicory/Pasja mix, is graze it all off hard then undersow the paddock with a rye/clover mix. Normally chicory only lasts 3 to 5 years in permanent pastures. Stock can get a liking for it and will preferentially graze it. Deer graze it down to ground level before eating anything else. It will go stalky if left too long when stock will find it less palatable. For dairy farmers it is popular due to its by-pass protein content. There is also reported anthelmintic value with lower internal parasite numbers found in stock compared to other pasture species.

Including Puna in pasture mixes has increased some animal performances dramatically. Lambs on pure Puna hardly needed worm drenching. Its erect growth away from the soil so from the internal parasite larva could be one reason.

It can withstand relatively long periods without rain, but produces at full production for only a year, then decreases.

Young plants look like dandelions or docks, but have purple flowers so soon become distinctive.

Heavy frosts can heave the plants out by their tap root. In these conditions some farmers broadcast one kg/ha each spring and frost heave buries the seed.

Oversowing into long dense pastures has not been successful in trials by me and others, but on to short pasture showing bare ground, and trampled in by heavy grazing, so that seeds contact the soil, have been very successful. Superstrike coated seed has given better gemination. One kg of Plantain per hectare is enough. To broadcast at low rates, seeds will need bulking up with other seed, lime or sand.

I did a lot of sowing (seeding) and oversowing so made this seed sower which uses an old vehicle generator that an auto electrician motorised for me. It is earthed through the mounting on steel and a positive cable through a switch coupled to the battery. A funnel shape in the bottom of the old 90 litre (20 gallon) milk can was formed with cement, sawdust and pumice or other light materials. Use a 200 litre (44 imperial gallons, 53 US gallons) plastic one these days. The spreading rate is controlled by a lever from the tractor seat to a V shaped slide. Try Cook and Galloway Engineers, http://www.cookandgalloway.co.nz/ 5 Belfast Place, Box 5117, Frankton, Hamilton 3242, 07-847-7583 lloyd@cookandgalloway.co.nz for a USA made front mounted one.

Puna is liked by all grazing stock. Trials at Lincoln University in Canterbury, New Zealand showed lambs on a high allowance of Puna of 3 kg (6.6 lb) DM per day grew faster than lambs on most other pastures.

A three year study comparing deer grazing Puna with ones on a ryegrass and white clover pasture at Massey University, showed enormous benefits in venison and velvet production. Red deer carcass weights were 11% higher on Puna, and hybrids of 25% elk and 75% red were 28% higher. Velvet production was 65% higher for reds and 164% for hybrids. One can expect similar advantages for milk and beef. Horses also like it.

NZ AgResearch Grasslands reported earnings of up to NZ$1,400 per ha over four summer months on sheep farms.

These almost unbelievable increases are partly because Puna is highly digestible so moves through the rumen very quickly, so the animals don't feel full, and keep eating. This same principle applies in New Zealand when grazing perennial ryegrass and the best white clovers lush pastures, which give high animal production of milk and meat without grain.

Over the years I've done many comparative trials and always analysed the 17 elements, and to

prescribe the best LimeMagPlus. Annual pasture yields were between 16,387 and 20,038 kg DM/ha (14,800 and 18,000 lb) measured with a pasture gauge. Plate meters can't measure the tall stems of chicory.

One kg/ha of chicory in a new mix of phalaris, cocksfoot (orchard grass), and white clovers including Tahora 2 white clover, yielded a total of 19,649 kg pa, but less before summer, and 389 kg less in total than the best perennial ryegrass, best winter ryegrass and best white clover (at the time), that yielded 20,038 pa. The chicory mix yielded about 12% more from February to April, then yielded about 10% less. In climates hotter than the Waikato, which occasionally goes to 29 degrees C (84 F) in the shade, chicory will yield relatively more, but only in the first year, after which it thins.

Comparative tests in the 1990s showed that Tahora white clover produced more nitrogen than any other clover.

An older perennial ryegrass, older white clover and the then best winter ryegrass yielded only 16,387, showing how pasture species have improved, however the benefit from new varieties will only occur it correctly limed and fertilised as they were when developed, and not overgrazed, which they are not, when being selected.

Benefits

• High feed value.

• Highly palatable to most grazing animals, encouraging high animal consumption and so good production.

• Deep rooting.

• High mineral content drawn from subsoils. Some claim that it is high in all minerals, but while it is good, it is not magical, so can't be high in selenium in New Zealand which is low

• Thrives under controlled grazing.

• Grows well under a wide variety of climates.

• Has no known diseases.

• With winter growing grasses and clovers can yield up to 20,000 kg/ha pa (18,000 lb/acre).

• With pasture, it makes good silage, but needs wilting sufficiently to get moisture out of the stems.

Preferred Conditions

• Deep well-drained fertile soils, with all necessary minerals and organic matter.

• A pH of 6 to 6.2

• Needs to be buried when sown, so needs to be Cambridge rolled followed by a brush, trampled or drilled in to pasture.

Dislikes

• Wet acid soils.

• Being pugged.

• Flat weed sprays which will kill it.

• Being grazed too short too many times.

Note: Where varieties' names have not been mentioned it is for fear of litigation, not of being wrong. For example, if I mentioned the name of "best" some may claim that theirs were better. Also much of the research is years or even decades old and varieties have improved since then. I have tremendous respect for the plant breeders who improve grasses, clovers, crops, flowers, fruits and others, but as in everything, there are twisters. One promoted their hybrid ryegrass as being the highest yielder and showed figures until the end of December, however another hybrid kept growing into January and early February in a southern summer, yield more in total and when feed is worth more.

The NZ Department of Agriculture used to grow most pasture cultivars

An important benefit of chicories is their upright growth and no facial eczema spores.

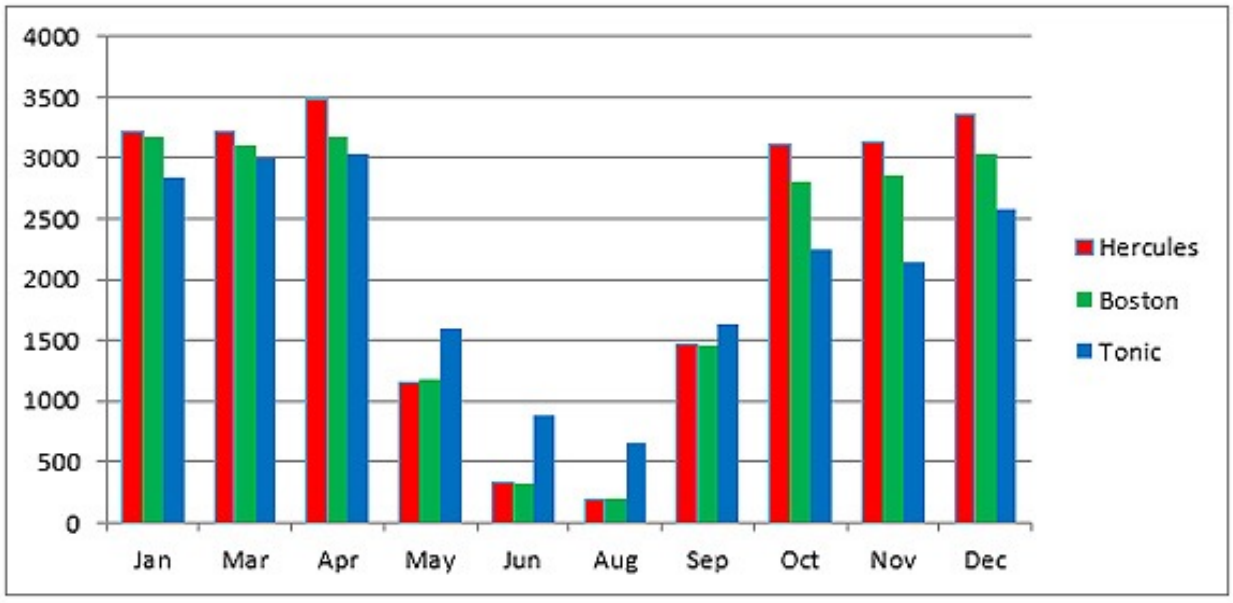
In the Waikato I would not sow Puna in pastures just for more summer feed. The new endophyte-free

fescues can out-yield it, and last for many years. However, Puna's big advantage is its high mineral content, and the ability to produce fast-growing healthy animals. I would sow one kg per ha of the best summer annual chicory with Pasja brassica, or better still Pasja and an annual grass of Nutrifeed in warm areas and Shirohie millet in cooler areas.

The best Plantain can be sown with Chicory for increased yields and variety that animals like, so they eat more and produce more. See below.

Plantain trial results

	Jan	Mar	Apr	May	Jun	Aug	Sep	Oct	Nov	Dec
Hercules	3220	3220	3487	1161	332	188	1476	3107	3129	3363
Boston	3172	3103	3176	1172	316	192	1456	2811	2855	3029
Tonic	2846	2994	3041	1598	886	660	1641	2254	2136	2572



Hercules Plantain yielding more in summer is an advantage in our recent summer droughts.

Sowing and Management

Seed costs a lot per kg because seed yields are low, but little is needed for grazing. 1 to 2 kg/ha in a mix is best sown in spring and no deeper than 1.2 cm (half an inch) deep.

If drilling Puna, do so immediately after grazing the existing pasture really short, and don't drill deeper than 1.2 cm. When drilled on a Waikato dairy farm, the paddock was grazed until two days after drilling and again after 16 days. A spring dry spell had reduced general pasture growth, but the chicory was 7.5 cm (3") tall after 16 days and flourishing. The strike rate was good, and its fast growth meant it provided extra grazing without altering the rotation.

Very frequent or heavy grazing will reduce regrowth, particularly when wet, because trampling can damage the crown which protrudes above the thick tap root. Its high mid-summer growth rate means that control with frequent grazing is important, to prevent it from bolting to seed. If it gets above 50 cm (20 inches) animals will not eat it all unless hungry.

When broadcast into existing pasture two days before grazing (to swell in the moisture) and trampled in, it grows well in bare areas, so thickens pastures, which helps reduce summer-grass and weed infestation. It won't germinate when broadcast into dense under-grazed pasture with a mat of thatch, because the light seed doesn't reach the soil. In these conditions it should be drilled. If necessary take the opportunity of drilling in other required grasses and clovers at the same time to improve your pastures.

The high summer yield of Puna, and the fact that animals like it so much, reduces summer milk-slump problems. In summer it reduces animal consumption of endophyte and toxic spores which cause facial eczema, provided there are enough and all animals eat herbs.

It is recommended that dairy cows graze paddocks containing Puna chicory immediately after milking, for a maximum of three hours to prevent milk taint. Stock usually eat the Puna first, so when cows are in mixed pastures for 12 hours it is usually finished within a few hours of going into the paddock so milk taint problems are unlikely, unless there is too much Puna and not enough cows.

This Waikato winter photo shows Puna Chicory (flat leaves) that was drilled in after the 2008 Waikato summer and autumn drought. The dung pats were because no useful rain had fallen from December to June when this was taken so earthworms had been inactive.

Puna can be sown with pasture or on its own as a summer forage crop in spring at 5 kg/ha (4 lb/acre), but for optimum yields it is best sown with a brassica. Puna will continue to grow after the brassica is all eaten, but cultivating for the new pasture will kill it, so pasture seeds should be broadcast and covered lightly with a snig chain, brush or similar, to prevent damage to the Puna. Chisel ploughing to bring up some subsoil should be done before sowing Puna and any crop. See Soils > Cultivation. Subsoil brought up can be as good as, or better than, buying rock dust, but much less costly.

Rotational grazing each time Puna is about 30 cm (12") high is recommended.

Chicory sown in too many paddocks on a farm could create a problem controlling the summer growth, and if hay is to be made the chicory with its thick stems will take longer to dry than the grasses, so it can heat and go mouldy. Silage making with chicory in pastures is fine.

It is an improved weed so flat-weed killing hormones kill it. To avoid this sow it in weed-free paddocks and avoid practices that encourage weeds, such as delays from the start of cultivating to sowing, low fertility, over-grazing, pugging, under and over draining, under-fertilising, etc. See Soils > Cultivation.

If the paddocks to be cropped are used as sacrifice paddocks, spraying before cultivation need not be done and the animal manure will make the crop do better.

Analysis

The following tissue analyses levels show how high chicory is in the important elements. Its deep tap root is able to bring up minerals from most soils that ordinary pastures with 15 cm (6") deep roots can't. The following are typical herbage levels under similar and optimum conditions in spring. Puna's high potassium (K) levels mean that it is best grown with species lower in K. Low N levels are better for Camelid's health and can be achieved by feeding hay daily.

Optimum Mixed Pasture		**Puna Chicory**	**Tonic Plantain**
N	4.5%	4.3%	3.6%
P	0.4%	0.41%	0.4%
K	2.7%	3.4%	2.8%
S	0.4%	0.35%	0.57%
Ca	0.8%	1.4%	2.8%
Mg	0.24%	0.4%	0.2%
Na	0.2%	0.9%	0.5%
Fe	90 ppm	110 ppm	200 ppm
Mn	50 ppm	57 ppm	26 ppm
Zn	50 ppm	80 ppm	40 ppm
Cu	13 ppm	20 ppm*	16 ppm*
B	22 ppm	33 ppm	15 ppm
Mo	1.5 ppm	1.0 ppm	0.5 ppm
Co	0.13 ppm	0.10 ppm	0.12 ppm
Se	0.3 ppm	0.15 ppm	0.15 ppm
I	0.5 ppm	0.15 ppm	?

The Tonic Plantain figures above are from Hill Laboratory, Hamilton, NZ. The Puna and pasture levels are from a farm I managed. Most pasture levels are much lower than the above because of not liming and fertilising based on pasture analyses, whereas most herb levels are more like the above because they are usually on better farmed land.

* Sheep breeds vary in their handling of copper, so read the chapter on Sheep. All could suffer copper toxicity if fed for too long on too much Plantain, Puna or lucerne alone, because their copper levels are so high and molybdenum levels in lucerne so low. If pasture growing with these herbs has copper levels below 10 ppm and molybdenum above 1.5 ppm it will reduce the problem. Correct agricultural lime levels usually keep molybdenum levels where they should be.

Lamb Weight Gains	Grams/day	Ounces/day
White clover	321	11
Lucerne	308	11
Puna Chicory	300	11
Roa Tall Fescue	266	10
Matua Prairie Grass	230	8
Wana Cocksfoot	225	8
Non-endophyte Ryegrass	225	8
Rangi Rape	165	6
High endophyte Ryegrass	155	6

Dandelions

This is a deep rooting plant with a yellow flower which is in many pastures in varying quantities, but is too low yielding on $30,000 per hectare land. Plants seed prolifically and blow quite a distance. Animals love it, but, the more dandelions, the lower the pasture production, for two reason; dandelions produce very little dry matter and are a sign of low calcium levels in soils, so clovers don't thrive, so nitrogen for grasses will be lacking.

Farmers have noticed that when their animals are low in minerals, they will eat the dandelions first, but, when dandelions dominate pastures, animals will eat the clovers first, again showing that they prefer what there is least of.

They have high levels of some elements, namely calcium 1.2%, magnesium 0.30%, sodium 1.54%, boron 38 ppm and cobalt 0.54 ppm. This amounts to two to three times the levels in ryegrasses. I've seen cows deficient in minerals rush into paddocks with dandelions and eat them first, right down to soil level. A farmer on not very well farmed Waikato peat told me that the milk always went up in his dandelion paddocks.

In moderation, dandelions are beneficial to soils, with their thick, deep tap roots which improve drainage after they die, and to animals by providing variety and minerals from deeper levels, some we don't even know about.

A few in pastures don't matter, but too many can indicate low fertility and low calcium in particular. Never spray dandelions to kill them because their seeds are usually plentiful in most soils, so they will grow again if there are bare patches. Rather apply lime and fertilisers to improve the fertility so that grasses and clovers out-perform dandelions.

Plantain (Plantago major) – broad leafed plantain. Hundreds of seeds per m2.

Plantain on the left is a perennial flat weed found in many pastures, sometimes called Ribgrass and not very attractive to animals. It shoots to seed very quickly. It was improved by Dr Alan Stewart at the Ceres Research, NZ, where it has persisted under beef, sheep and dairy cows, and yielded as much as ryegrass based pastures. It is deep rooted so has more calcium and copper than grasses. It has been selected for yield, palatability, feed value, survival in New Zealand conditions, etc.

Tonic has broad ribbed leaves grown from a central crown and performs well in all most types, however it is not tolerant of water-logged soils. Tonic can be sown on its own, but is best with grasses and legumes. If plantains become dominant in pastures they can cause milk taint in dairy cows if grazed for extended periods.

Tonic Plaintain is more erect so suitable for cattle rotational grazing, while Lancelot is less erect for closely grazed sheep pastures in cooler areas. In dryland Canterbury, Tonic yielded 12 t/ha in the second year, while Nui perennial ryegrass yielded 13 t/ha. Over winter, Tonic yielded 70% as much as perennial ryegrass, and Lancelot 30%. Both are deep rooting, yielding 20% more than perennial ryegrass during summer dry weather.

Tonic and Lancelot establish nearly as easily as perennial ryegrass, but during establishment they can be smothered by grasses. Original plants can survive for five years, depending on management. They reseed prolifically and in hay, which takes a bit longer than grasses to dry.

This Tonic, taken in winter, was oversown on heavy clay. Note how well it grows in fertile areas. It can be oversown in spring or autumn, but can fail if not trampled in or if rain doesn't fall. Sow on its own at 6 kg/ha, or mixed in pastures at 3 kg/ha.

Adding Tonic plantain to summer crop mixtures give animals more minerals, and Tonic's deep roots give drought resistance. Tonic needs to be grazed at least every three weeks, so can be grown with Pasja and Shirohie millet, but not with turnips.

When grown with perennial ryegrass and clovers, Tonic didn't produce as much lamb or wool as Puna chicory did with pasture. Plaintain has not given the increased animal production that was hoped for, and if not grazed frequently and sometimes heavily, can become unpalatable with a high proportion of stem.

Research is being done on using plantain for internal parasite control.

Some farmers are having success oversowing the whole farm with Tonic which establishes well, especially in bare patches; however, it doesn't survive deep freezing winters.

Tonic Plantain is comparatively low in protein, which is an advantage in New Zealand's high protein pastures (23% versus clover based pasture's 28%), but high in calcium (2.8%), sodium and copper.

Plantain Lancelot (Plantago lanceolata) – is a narrow leafed plantain more suitable for sheep. It survives longer in cold climates, but yields are low.

The taller nature of Tonic Plantain reduce the infection of grazing animals with internal parasites.

Plantain can reduce scouring, so sheep can have fewer dags, and it is an antioxidant which can help animals be more healthy. Healthy animals are less affected by parasites.

Plantain Lancelot (Plantago lanceolata) is a narrow leafed plantain suitable for sheep, and survives longer under sheep grazing and in cold climates, but yields are lower than Tonic.

Cysteine is an essential amino acid that is in some foods and is required by sheep to produce wool. Consequently, during droughts sheep stop producing wool, but some sheep have been developed which can make their own cysteine.

Pests -

Other than slugs, there are no known pests affecting these herbs. Read Pests.

Wormwood (Artemisia absinthium)

The word "wormwood" is influenced by its traditional use as a cure for intestinal worms. It has been

used to rid the body of worms since ancient times. It has long been used to cause abortions and induce labour, and more recently to treat epilepsy and spasms.

When made into tea, Artemisia absinthium can been used to treat appetite problems, diarrhea, gallbladder problems, nausea, stomach pain, and vomiting.

Wormwood oil can be applied externally to bruises, cuts, itching, skin irritations, and sprains. The oil acts as a local anesthetic and can be applied to relieve the pain associated with arthritis (also take Thorne boron), lumbago, neuralgia, rheumatism, tuberculosis, and other ailments.

Silver-green foliage and nodding yellow flowers, true wormwood is a worthy garden plant and thrives on dry edges and in the full sun. This is the plant that is used for making traditional bitters, also an ingredient in absinthe, and also used in herbal medicine as an effective vermifuge. Of course, unreasonably high dosage or extended use can prove toxic due to a buildup of thujone in the system. Sow tiny seeds on surface of sandy soil. A gratifyingly easy germinator and a long-lived plant on the landscape. In the fall, cut back to just an inch or so above the old growth.
Not for sale to South Dakota or Washington State.

The plant can easily be cultivated in dry soil. They should be planted under bright exposure in fertile, mid-weight soil. It prefers soil rich in nitrogen. It can be propagated by growth (ripened cuttings taken in March or October in temperate climates) or by seeds in nursery beds. It is naturalised in some areas away from its native range, including much of North America.

The plant's characteristic odor can make it useful for making a plant spray against pests. In the practice of companion planting, because of the secretions of its roots, it exerts an inhibiting effect on the growth of surrounding plants, thus weeds. It can be useful to repel insect larvae but it need only be planted on the edge of the area of cultivation. It has also been used to repel fleas and moths indoors.

Consumption of the herb is thought by some to help induce lucid dreaming.[citation needed]

It is an ingredient in the spirit absinthe, and also used for flavouring in some other spirits and wines, including bitters, vermouth and pelinkovac. It is also used medically as a tonic, stomachic, antiseptic, antispasmodic, carminative, cholagogue, febrifuge and anthelmintic. In the Middle Ages it was used to spice mead.[2]

Wormwood is the traditional color and flavor agent for green songpyeon (a type of dduk/tteok, or steamed dumpling/'cookie' made of fine rice flour), eaten during the Korean thanksgiving festival of chuseok in the Autumn. Wormwood is picked in the spring when it is still young. The juice from macerated fresh (or reconstituted dry) provides the color- and flavor-giving ingredient in the dough prepared to make green songpyeon. The other traditional color for these small desserts is white, made with rice flour dough sans wormwood extract.

Therapeutic uses

The leaves and flowering tops are gathered when the plant is in full bloom, and dried naturally or with artificial heat. Its active substances include silica, two bitter elements (absinthin and anabsinthine), thujone, tannic and resinous substances, malic acid, and succinic acid. Its use has been claimed to remedy indigestion and gastric pain, it acts as an antiseptic, and as a febrifuge. For medicinal use, the herb is used to make a tea for helping pregnant women during pain of labor. A dried encapsulated form of the plant is used as an anthelmintic.

A wine can also be made by macerating the herb. It is also available in powder form and as a tincture. The oil of the plant can be used as a cardiac stimulant to improve blood circulation. Pure wormwood oil can be poisonous.

More information and seed are at -
http://www.bouncingbearbotanicals.com/wormwood-p-75.html?affiliate_banner_id=1&ref=284

Yarrow

This herb has flat white, pink, yellow or lavender flowers, has minor health benefits, and animals eat it so don't worry about it being a weed. Under correct liming and fertilising it will not multiply too much. Under very high fertility and intensive controlled grazing it can disappear.

Google more for more on Herbs.

Vaughan Jones
GrazingInfo Ltd
www.grazinginfo.com