Oregon State University

AGRONOMIC CROP SCIENCE REPORT

Research Extension

COMFREY AS A FORAGE

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For a number of years now there has been a lot of promotional work associated with one or more species of the plant comfrey. The campaign apparently is continuing. Since about 1952, much publicity in the form of advertisements in newspapers, magazines, and circulars has been disseminated, mostly by sellers of comfrey propagating stock. The most sensational of the many claims made for the crop are:

1. Tremendous yields of forage--up to 139 tons of green material per acre.
2. High nutritional and medicinal value of the forage for livestock and human food.
3. Ability to grow where nothing else will grow, and producing its high yields even under drought conditions.

This report contains some information about comfrey as a forage to enable prospective growers to form their own conclusions as to the probable value of this crop in Oregon.

Three different species of the genus *Symphytum* are sold interchangeably as Quaker (also referred to as Miracle Quaker and Marvel), Russian, or prickly comfrey. These species have been referred to in scientific articles and in advertisements by the following scientific names:

Common comfrey	*Symphytum officinale*
Prickly comfrey	*Symphytum asperrimum*
Russian comfrey	*Symphytum peregrinum*
Quaker comfrey	*Symphytum asperrimum*, and also as *Symphytum peregrinum*
Marvel Quaker comfrey	*Symphytum peregrinum*

Comfrey is a member of the Boragineae family, a large family of mucilaginous and slightly bitter plants that includes heliotrope and gromwell. Comfrey is a perennial herbacious plant that reaches a height of 2 to 4 feet, with many large, heavy leaves. The leaves are hairy, have a dark green color, and many feel somewhat sticky. In appearance comfrey resembles a tobacco plant with short internodes. It produces bright blue, white, or pink flowers, borne in nodding one-sided clusters. The roots are large and fleshy and in loose soil will reach a depth of 8 to 10 feet. The plant is hardy, will endure considerable cold or drought, making rapid growth when conditions are favorable.

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Comfrey plants will bear seeds, but the seed is very low in germinating ability. Thus, plants are reproduced by vegetative means, either by root divisions or root cuttings.

Yield and Feed Value

Prickly comfrey, which is very similar to Quaker comfrey (even considered to be identical by some botanists) received considerable publicity as a forage plant around the turn of the century. It was studied by the U. S. Department of Agriculture and several state experiment stations, with the general conclusion that it did not have a place as a forage plant in the United States (USDA Circular AP 198). Prickly comfrey produced high green matter yields under favorable conditions, but the quality and dry weight yields were inferior to those of common forage plants such as alfalfa and red clover. Silage was of poor quality because of the watery, gummy nature of the leaves.

According to Richard H. Hart, USDA Agronomist, comfrey has consistently been inferior to the more common forage crops both in yield and in nutritional value (Richard H. Hart, "Comfrey Yields and Forage Value," United States Department of Agriculture, Agricultural Research Service Plant Physiology Institute, Beltsville, Maryland, CA-NE-2, December 1972). Even so, Quaker, Russian, and prickly comfrey frequently are promoted as forages. Hart says that research in the United States and many foreign countries has shown that claims of very high yields, high protein values, and high ash content are not justified. Comfrey yields, in practice, are decidedly lower than the yields often promised by promoters, and lower than yields of more common forage crops. Hart further reports that most comfrey protein is indigestible, and much of its ash content results from contamination with soil.

Comfrey yields of more than 100 tons of green matter per acre have been claimed. Investigation of the reports indicate that these yields are based on a few plants grown under garden-like conditions and from regions of year-round or nearly year-round growing season. Yields in carefully conducted experiment have never been this high. Hart's report presents representative yields from Vermont and Wisconsin as well as a number of foreign countries. These yields are shown in Table 1 and are listed from the highest dry matter yield to the lowest. When yields from several different strains of comfrey or different management practices were determined in an experiment, only the highest yield was included in the table.

Hart reported yields from other experiments as follows:

British Columbia	54.6 tons green matter per acre
North Carolina	11.6 tons green matter per acre
U.S.S.R.	6.1 tons dry matter per acre
Ontario	2.1 tons dry matter per acre
Quebec	1.1 tons dry matter per acre

Management data were not available for these experiments.

Most yield reports are given in green weight and are large because the comfrey leaves have a high water content. Yield trials at various experiment stations suggest that on a dry matter basis, yields of comfrey would be approximately that of alfalfa if the alfalfa is properly established and managed.

Table 1. Comfrey Yields Around the World

State or nation	Yields (T/A) Green	Yields (T/A) Dry	Spacing (inches)	Fertilizer Manure (T/A)	Fertilizer N - P - K (lb/A)	Cuts per year
South Korea	36.0	5.4	18	13	120- 54-107	6
Vermont	37.0	3.8	36	50	0- 0- 0	4
Netherlands	29.6	3.6	18	13	128-108-192	4-5
Wisconsin	33.7	3.2	18x48	Heavy	0- 0- 0	4
England	25.6	3.1	30x36	0	180-120-255	4-5
West Germany	22.3	2.4	16x24	0	68- 25- 25	2-4
Poland	14.9	2.1	16	0	54- 0- 0	3-4
Kenya	21.2	1.7	36	5	0- 29- 0	7

From: Hart. 1972. CA-NE-2.

Many strains of comfrey are sold, and there are large differences in yield. Hart reports that the English study included eight strains of comfrey; the two poorest yielded only 41 and 68 percent as much as the best strain. Yields of the best strain of comfrey were only 83 percent of the yield of kale, 76 percent of the yield of timothy, and 62 percent of the yield of ryegrass. Comfrey yields were 81 percent of red clover yields in Wisconsin and 74 percent of alfalfa yields in Kenya.

Crude protein content of comfrey in these experiments ranged from 12 to 26 percent. High nitrogen fertilization and more cuts per year usually produced higher content. However, Hart pointed out that digestibility of comfrey protein was only 38 percent in an experiment conducted in the Netherlands and only 49 percent in a California experiment. Alfalfa protein, in comparison, is over 70 percent digestible. In South Korea, the total dry matter of comfrey was 56 percent digestible, while that of orchardgrass and ladino clover was 64 and 73 percent digestible, respectively.

Also, protein analysis values on comfrey are high and fiber values low because leaf tissue composes most if not all of the material tested. Fifteen to 24 percent protein on a dry matter basis have been reported. Alfalfa leaves have a protein content greater than 20 percent, but alfalfa hay may be lower because it also includes the stem tissue which has a lower protein value.

According to Hart, the ash content of comfrey was high in most experiments but much of the ash may have resulted from soil clinging to the hairy leaves of the comfrey plants. In the Kenya study, such contamination accounted for 14 percent of the uncorrected dry matter yield.

Table 2 shows the Quaker comfrey yields and percent protein obtained in tests at Davis, California. In that area they regularly harvest 12 tons of alfalfa per acre so comfrey was no more productive than their alfalfa. The protein content appears to be equivalent to, or possibly a bit better than alfalfa.

Table 2. Quaker Comfrey Yields and Protein Content, University of California at Davis, 1958.

Harvest date	Yield per acre Green	Yield per acre Dry	Protein Dry wt. basis
	Pounds	Pounds	Percent
June 3	104,544	7,318	21.17
July 1	40,656	4,066	24.15
August 6	46,464	5,576	22.31
November 11	39,688	7,144	15.74
	231,352	24,104	20.84 average

From: Agronomy Notes--February 28, 1961.

Though comfrey may be a valuable feed crop for its protein content, as is shown in Tables 3 and 4, generally it is no better than alfalfa in yield of dry matter or in the percentage of crude protein, and digestibility is inferior to alfalfa.

Table 3. Chemical Composition of Russian Comfrey

	Dry matter	Moisture	Crude protein	Crude fat	N-free extract	Crude fiber	Ash
	Percentages						
Dried leaf	83.4	16.6	26.4	2.8	28.2	11.7	14.3
Dried stem	80.2	19.8	10.2	2.1	29.3	28.6	10.0
Fresh leaf	12.0	88.0	3.8	0.4	4.1	1.1	2.1
Fresh stem	12.1	87.9	1.5	0.3	4.7	4.1	1.5

From: Ikeda, Uchimura, and Matsui. 1962. Hiroshima U. Facul. of Fisheries and Anim. Husb. J. 4:103-109.

Table 4. Composition, Digestion Coefficients, and Nutritive Values of Russian Comfrey Leaves and Alfalfa Hay

	Dry matter	Crude protein	Ether extract	Crude fiber	N-free extract	Ash
			Percentages			
Russian comfrey (leaves only)*						
Composition	100.0	15.0	1.7	12.3	43.4	27.6
Disgestion coefficients	67.3	69.0	65.3	46.0	70.8	--
Nutritive value (dry)	DCP** 10.4%		TDN 49.2%			
Alfalfa hay, sample #1 (no details on stage of growth, harvest management, etc.)*						
Composition	100.0	14.4	1.5	33.7	42.0	8.4
Disgestion coefficients	47.6	59.5	33.4	34.9	56.7	--
Nutritive value (dry)	DCP 8.6%		TDN 45.3%			
Alfalfa hay, sample #2 (no details on stage of growth, harvest management, etc.)*						
Composition	100.0	15.9	1.5	34.3	39.9	8.4
Digestion coefficients	55.6	68.8	39.9	37.6	67.2	--
Nutritive value (dry)	DCP 10.9%		TDN 52.1%			
Alfalfa hay (sun-cured, early bloom stage)#						
Composition	100.0	18.4	2.2	29.8	40.2	9.4
Nutritive value (dry)	DCP 14.4%		TDN 58.0%			

*From: Elliot and Croft. 1958. Rhodesia Agricultural Jour. 55:40-49.
#From: United States--Canadian Tables of Feed Composition, 1969, National Academy of Sciences--National Research Council Publication 1684.
**Digestable crude protein.

Canadian studies have shown some other interesting features (Table 5). The in vitro digestible dry matter (IVDDM) remained essentially constant with advancing maturity of the first cut, but digestibility of the regrowth material was markedly lower. The crude protein content of the early first cut material was quite high; however, the percent protein decreased with advancing maturity.

Table 5. *In Vitro* Digestible Dry Matter (IVDDM) and Crude Protein Content of Russian Comfrey at Various Stages of Growth (Whole Plant Basis)

Stage	IVDDM	Crude protein
	Percent	Percent
Early	64.8	21.1
Medium	66.3	17.0
Late	65.4	15.2
Regrowth	53.2	17.7

From: Mowat, Christie, and Gamble. 1966. Canada Dept. of Agr., Forage Crop Division, Forage Notes 12(1):63-64.

Mowat, Christie, and Gamble also found that stems were more digestible than leaves (Table 6). With advancing maturity, a decrease in the digestibility of both the leaf and stem segments occurred. The IVDDM of the whole plant was not influenced as greatly because of a decrease in the proportion of leaves. The digestibility of the whole plant regrowth also was lower. Part of this was reported to be due to greater leafiness.

Table 6. *In Vitro* Digestible Dry Matter (IVDDM) and Crude Protein (CP) Content of Russian Comfrey Leaves and Stems Separately and Calculated Values for the Whole Plant, Based on the Leaf:Stem Ratio

Growth stage	Leaf			Stem		Whole Plant	
	IVDDM	CP	Leaves	IVDDM	CP	IVDDM	CP
			Percentages				
Bud 1st cut	61.9	23.9	64.6	72.2	11.1	65.5	19.3
Flower 1st cut	49.2	19.6	52.4	65.4	7.8	56.6	14.0
Bud regrowth	43.5	19.6	80.7	67.5	10.8	48.2	17.9

From: Mowat, Christie, and Gamble. 1966. Canada Dept. of Agr., Forage Crop Division, Forage Notes 12(1):63-64

Establishment and Management

Comfrey is propagated from root cuttings. The crop should be cultivated to control weeds, for grass can be especially competitive with comfrey. No herbicides are cleared for use on comfrey. The planting must be maintained at a high fertility level for optimum yields. Comfrey grows best on deep, fertile soils having good drainage. It does not thrive on strongly acid soils. Summer rainfall or irrigation also is necessary to insure high yields. Some difficulty has been reported in getting stands from root cuttings, due to root decay before emergence. The cost of root cuttings alone will be several hundred dollars per acre, in addition to expense of land preparation and planting. Compare this with the cost of 15 or 20 pounds of alfalfa seed per acre.

Grazing very quickly destroys comfrey plants, while the high water content (85 to 95 percent) causes problems in hay making. Comfrey leaves are quite fleshy and dry quite slowly, thus it is difficult to make good quality hay. Also, the thick midribs and stems give trouble in hay making. In a study in the Netherlands, only two of four attempts to make silage were successful, and even then up to 30 percent of the dry matter was lost during the ensiling process. Other dry materials such as beet pulp or straw should probably be mixed with comfrey in the ensiling process.

Because the leaves are covered by stiff hairs, comfrey is reported to usually be unpalatable to stock in the growing state. When cut and wilted for a few hours, however, the hairs collapse and most types of livestock are reported to eat it readily.

Summary

Comfrey has been known in agricultural areas for many years. It produces leaves that have a high water content, high protein, and low fiber. Close spacing, high rates of fertilization, and frequent cutting are necessary to produce the high yields often advertisied. The high cost of establishing a stand, necessity to cultivate for weed control, the high rates of fertilizer required, plant characteristics that make it difficult to harvest and cure on the farm, and its performance in comparison to forage crops such as alfalfa, red clover, and orchardgrass are factors to be considered before planting comfrey.

Investigate potential markets for both roots and top growth before planting the crop and attempt to assure yourself of a market if you will not be utilizing the crop on your farm. Deal with reputable firms. If you do not know the company, investigate its history of business. Beware of companies that advertise comfrey as a crop to be grown under any kind of soil conditions and that make sweeping claims that comfrey will cure all maladies and ailments. Comfrey has certain limitations, as does any other crop, and reputable firms will gererally inform you of problems that might be encountered.

The information contained in this report is for your consideration. This report is not intended as an endorsement for comfrey nor a recommendation against it. You must make that decision for yourself, based upon all information available to you.