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ANNUAL MEDICS FOR RANGE AND GRAIN LANDS

BY

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Introduction

Most of the annual rangelands in California are limited in the quantity and quality of forage produced because of a nitrogen deficiency. Although native and introduced legumes are often present, they are prevalent in the higher rainfall areas or during the wettest years. Legume varieties which are adapted to less favorable conditions are rather scarce in California.

Commercial varieties of medics are now available, however, which can correct this shortcoming. They also have the potential of fitting into a cereal crop-annual legume rotation program as practiced in Australia and Northern Africa. Experimental and commercial medic seedings in San Luis Obispo County since the 1960s have been successful and varieties introduced since 1985 show even greater promise for range and grain lands.

Definition and Distribution

Medics are annual legumes in the Medicago plant genus. The most common medic in California is known by a misnomer as bur clover. Medics can be distinguished from the clovers (Trifoliums) by their yellow flowers and the long stalk on the central leaflet of the trifoliate leaves.

Medics originated in the Mediterranean area where some 30 species are found growing as native plants. Some species are now widely distributed in moderate climates of the world. The species that have become disseminated the most are the ones that have spiny burs that attach to animals and other traveling objects.

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[1]Farm Advisors, San Luis Obispo and San Diego Counties, respectively.

The Australian Connection

Medics are well adapted to large areas of southern Australia and have been used for pasture improvement and cereal crop-annual legume rotations since the 1930s. In Western Australia, however, pasture improvement before 1960 almost invariably meant sowing subterranean clover since it grew in a wide range of soil and rainfall conditions. It was a disappointment, however, on some of the heavier soils of the cereal and sheep districts. Attempts were made in the 1950s to seed a commercial barrel medic, but it was too late-maturing for the low rainfall districts where most of the suitable medic soils are found. Then the release of the early-maturing Cyprus barrel medic in 1959 and Harbinger strand medic in 1963 changed the situation entirely, and medics have since been widely planted in Western Australia.

Nitrogen Builders

Legumes add nitrogen to the soil which benefits associated nonlegumes. Large amounts of nitrogen from the air are changed into an available form for plants in nodules on the legume roots, if an effective strain of nitrogen-fixing bacteria is present. This is assured by inoculating the seed with a specific strain of bacteria using a cohesive material just prior to planting. A good stand of legumes on California dryland range adds an average of about 50 pounds of nitrogen per acre during one growing season according to University of California researchers. This is equivalent to 250 pounds of ammonium sulfate.

Adapted to Alkaline Soils

The nitrogen-fixing bacteria associated with medics appear to have a poorer tolerance to soil acidity than the bacteria associated with clovers. This is probably one of the main factors limiting medics to soils with an alkaline or neutral trend through the profile. In cases where soils are neutral or variable in pH, seeding a mixture of clovers and medics is advisable.

Varieties Available

Before 1985, the commercial varieties of medics imported to California were Jemalong, Hannaford and Cyprus barrel medics and Harbinger strand medic. (Barrel describes the shape of the seed pods and strand refers to the coastal distribution of the species.) Now there are at least five other commercial varieties which have been imported from Australia. Some of these are very early-maturing and therefore well-adapted to low rainfall areas. Serena bur medic, for example, flowered two months earlier than bur clover (February 1 versus April 1) in a low rainfall area of eastern San Luis Obispo County during 1986. Other varieties are more upright in growth habit (Robinson snail, Paragosa gama, and Circle Valley bur) and are very productive in areas with 15 or more inches of annual rainfall.

Seeding Recommendations

As mentioned before, medics can be seeded alone or with subterranean and rose clovers depending on the soil and climate. Annual legumes should be seeded in October with a range or grain drill in stubble or established rangeland or with a broadcast seeder or drill on prepared seedbeds. Proper inoculation just before seeding and shallow seeding depths of about 1/4 inch are important. The Pelinoc-Pelgel method of inoculation, which can be applied to the seed by the rancher, has given good results more consistently than pelleting methods applied by seed companies. When seeding with a drill, 100-150 pounds of 0-25-0 fertilizer should be placed with or near the seed.

High seeding rates, although often promoted, are not necessary for good stand establishment, especially if you can wait a few years for the plants to produce seed. These annual plants are very effective seed multipliers. Seed yields of 700 to 1,700 pounds per acre were measured, for example, in an established Jemalong barrel medic stand originally seeded with only 2-4 pounds per acre on a ranch near Cholame in San Luis Obispo County. So, to reduce economic risk, a seeding rate of 2-6 pounds of a mixture of medic varieties per acre is advisable. If clovers and/or grasses are included, the rate may total 6 to 12 pounds per acre.

Grazing Management

Medics, like other annual legumes, should be grazed well during their growing season to discourage competition from grasses and other plants. Since the seed pods make excellent high-protein dry feed, legumes can be grazed during the summer and fall months. The best grazing scheme, therefore, is to stock moderately to heavily during the winter and early spring growth periods, then let the plants rest while flowering and producing their last spurt of growth. This gives them a chance to produce seed and enough feed for grazing during the dry period.

After medics have produced mature seed for a year or more, grazing pressure while the plants are flowering or the seed is maturing generally doesn't destroy future stands. This is due to the presence of a high percentage of hard seeds which lay dormant for one or more years before germinating--a survival characteristic of medics and many other annual legumes.

Stands which are not grazed enough often revert to grasses and other nonlegumes in a few years. If proper grazing resumed, however, there is usually more than enough hard seed left in the ground for the medic stand to come back as strong as ever without reseeding.

Importance in California

If bur clover is already widespread in California, why introduce other medics? Because, as shown in Western Australia, the commercial medics are now more drought tolerant than bur clover and the subterranean clovers. Seedings dating back to the 1960s show that medics such as Jemalong barrel medic are adapted to alkaline soils (with a pH of about 7.0 or higher) in

even the driest rangelands of San Luis Obispo County. These plants will survive and produce high-protein forage in areas where no effective nitrogen-fixing legumes now exist.

The Alfalfa Weevil

Several counties in California have reported severe alfalfa weevil damage on their naturalized bur clover stands. There have been reports of alfalfa weevil damage to medic stands in Monterey and Glenn Counties. Long-term survival of medics in San Luis Obispo County seedings does not appear to be affected by the alfalfa weevil or other pests. Improved resistance to the alfalfa weevil is known to exist in the newer cultivars from the Australian Medic Breeding Program. Table 1 indicates the tolerance of several annual medics to the alfalfa weevil.

The Virtue of Patience

To achieve lasting results from medic seedings, the only thing that needs to be accomplished the first year is the formation of healthy nodules by the inoculated bacteria on the roots of the seeded plants. This does not require a high seeding rate nor even a high germination rate since many of the medic seeds will lay dormant for one or more years anyway.

So, patience is needed in evaluating early stands, especially if the first year is a dry one. Scattered plants rather than a solid stand should be expected and the medic roots should be carefully examined for large nodules containing red hemoglobin--a sign of nitrogen fixation. It is economical to establish medics with seeding rates of only 2 to 6 pounds per acre, but it may not be impressive at first. Time, some average or better rainfall years and grazing during the winter and spring growing seasons are necessary to show the full potential of medics and other annual legumes.

Fertilization

Although medics fix their own nitrogen, they are depended on phosphorus and sulfur from the soil. Soil tests can be used to detect phosphorus deficiency but are not reliable indicators of sulfur deficiency. Where phosphorus levels are less than 10-20 parts per million, fertilizing with 200-300 pounds of single superphosphate (0-25-0) per acre every three years will usually increase production. Before fertilizing large acreages, however, trial applications should be made to see if the results justify the cost. A Cooperative Extension farm advisor can suggest the correct way to do this.

For More Information

A farm advisor fact sheet titled Planting and Managing Annual Legumes and Perennial Grasses on Dryland Range has more details on the methods discussed above and also includes several recommended seed mixes for the central coast area. It is available from the Cooperative Extension office in San Luis Obispo. Reports on the use of medics in rotation cereal grain farming-annual legume programs can also be obtained at this office.

TABLE 1. LIST OF REGISTERED MEDIC CUTIVARS

Species	Cultivar	Source	Approx. Days to Flowering[1]	Tolerance to Alfalfa Weevil[2]
Medicago truncatula	Hannaford	Naturalized	99	P[3]
	Jemalong	Naturalized N.S.W.	105	F
	Cyprus	Cyprus	78	P
	Cyfield	Cyprus X two other strains	96	P
	Borung	Tunisia	95	P
	Ghor	Jordan	90	F
	Akbar	Israel	91	P
	Ascot	Cross of two S.A. lines	100	F
	Sephi	Israel	105	G
	Paraggio	S.W. Italy	105	F
M. littoralis	Harbinger	Iran via Calif.	89	P
M. Rugosa	Paragosa	Portugal	110	F
	Paraponto	Italy	100	F
	Sapo	Portugal	106	F
M. tornada	Tornafield	USA X Israel	95	P
	Murryland	Naturalized	96	F
	Swani	Libya	77	P
M. poymorpha	Serena	Naturalized X Chilean	62	F
	Circle Valley	Naturalized W.A.	96	F
M. scutellata	Robinson	Naturalized S.A.	108	P-F
	Sair	Select from Commercial Snail, S.A.	91	P
	Sava	Introduced via German Democratic Republic	106	F

[1]Adapted from Ewing, M.A. 1983. Medics return to favor. J. of Agriculture. West. Aust. Dept. of Agricuture 1:27-31.

[2]Adapted from Bernard C. 1972. Register of Australian Herbage Plant Cultivars CSIRO, Canberra and from Mackay, J.H.E. 1982. Register of Australian Herbage Plant Cultivars Supplement CSIRO Canberra.

[3]P = poor, F = fair, G = Good

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Table 2. Expected forage and meat production under favorable, average and unfavorable weather conditions for several soils.

Site and Practice	Dry Matter (lbs/a) Favorable	Average	Unfavorable
Soil Series: Altamont (Nacimiento, Ayar, Myers)			
Unimproved	3300	1800	800
Annual Legume (Unfertilized)	3850	1780	
Annual Legume (120 lbs/a S as gypsum)	3940	1775	
Annual Legume (200 lbs/a P as 0-40-0)	5350	1975	
Annual Legume (120 lbs /a S & 200 lbs/a P)	5510	2010	
Annual Legume (4000 lb/a lime)	4810	1955	
Soil Series: Corning			
Unimproved	2000	1100	300
Annual Legume (Unfertilized)	2800	1100	700
Annual Legume (300 lbs/a 0-20-0)	5700	2860	1995
Series: Josephine			
Unimproved	2900		800
Annual Legume (Unfertilized)	3600		
Annual Legume (600 lbs/a 0-20-0)	6800		
Annual Legume (285 lbs/a 0-35-0-20)			3700
Soil Series: Laughlin			
Unimproved	3000	2000	900
Subclover (Unfertilized)	3600		
Subclover (20 lbs/a as gypsum)	5400		
Subclover (40 lbs/a as gypsum)	6300		
Subclover (80 lbs/a as gypsum)	6700		
Subclover (200 lbs/a 0-38-0-20)	7500		
Series: Newville (Corning, Red Bluff, Dibble, Perkins, Redding, Pleasanton)			
Unimproved	1800	1200	300
Annual Legume (Unfertilized)	4000		
Annual Legume (650 lbs/a 0-20-0-16)	5000		
Annual Legume (350 lbs/a of 0-40-0-20)	5000		
Annual Legume (300 lbs/a sulfur)	4700		
Series: Sutherlin			
Unimproved	3000		
Subclover (Unfertilized)	3400		
Subclover (200 lb/a 0-38-0-20)	6100		
Series: Yorkville			
Unimproved	2800		
Subclover (Unfertilized)	2800		
Subclover (200 lb/a 0-38-0-20)	4210		
Series: Aubrun (Sobrante, Las Posas, Argonaut)	Beef (450-800 lbs) lbs/a		
Unimproved (less than 50% canopy)	45		
Annual Legume (Unfertilized)	89		
Annual Legume (40 lb/a N as Urea)	126		
Annual Legume (80 lb/a N as Urea)	153		
Annual Legume (40 lb/a N,30 lb/a P,33 lb/a S)	195		
Annual Legume (80 lb/a N,30 lb/a P,33 lb/a S)	215		
Annual Legume (30 lb/a P, 33 lb/a S)	128		
Annual Legume (60 lb/a P, 66 lb/a S)	175		
Series: Laughlin	Lamb (without ewes) lbs/a		
Subclover (Unfertilized)	817		
Subclover (188 lb/a S)	1313		
Subclover (50 lb/a S)	1162		
Subclover (188 lb/a S, 50 lb/a P)	1528		