

LUPIN PRODUCTION IN THE WESTERN AND SOUTHERN CAPE

Herman Agenbag

Introduction

One of the earliest references to lupin cultivation in South Africa is contained in Volume X1 of the Journal of Agriculture, Cape of Good Hope, 1897. In the reference, Mr JP de Waal compares blue, white and yellow flowering types. He also recommends that lupin seeds need to be sown densely and that seeds must be inoculated before planting.

Although there have been several local trials involving lupins since the start of the twentieth century, progress with lupin cultivation has been slow. Farmers were afraid that lupins would be toxic to sheep and that it could lead to a weed problem in wheat fields.

Only after Mr CP Wagener, a teacher/farmer in the Malmesbury district during the forties, selected plants without a hard scale and used these successfully as animal feed, as well as a rotation crop, did lupin production take off. By 1949 farmers generally accepted the value of lupins as a rotation crop and as animal feed. Since then lupins have played an important role in farming systems, particularly in the Swartland area. Areas such as Rûens initially derived little benefit from cultivating lupins, because there were better and more adaptable feed and rotation crops available in the area at that time.

Table 1. AVERAGE SEED YIELD (KG/HA) FOR LUPINS IN THE SWARTLAND AND RÛENS AREAS (1983 – 1996)

LOCALITY	BROAD LEAF LUPINS	NARROW LEAF LUPINS
Rûens	2 818	1 366
Swartland	1 994	1 534
Average	2 406	1 450

Table 2. CHEMICAL COMPOSITION OF LUPINS (% ON DRY MATTER BASIS)

	BROAD LEAF LUPINS	NARROW LEAF LUPINS
Crude protein	37.4	31.1
Lysine	1.80	1.50
Methionine	0.27	0.22
Crude fibre	11.1	13.3
Ca	0.3	0.2
P	0.5	0.3

Species

The most important lupin species currently grown commercially are *L. angustifolius* (narrow leaf), *L. luteus* (yellow lupin) and *L. albus* (broad leaf or white lupin). All lupin species are annuals and grow upright.

***Lupinus angustifolius* (narrow leaf lupin)**

The best known characteristics of this species are the small, narrow leaves making up the composite leaf. The plants are leafy with light to dark green leaves. Usually bitter lupin flowers are blue, pink or pale pink, while sweet lupins normally have white flowers. Flowers are borne spirally on the axle and are self-pollinating. Sweet and bitter cultivars contain a crude protein content of about 30-32 % for sweet cultivars and 28-30 % for bitter cultivars. Narrow leaf lupins do well in sandy to sandy loam soil.

***Lupinus albus* (broad leaf lupins)**

Broad leaf lupins have a strong tap root system. Under favourable growing conditions the plants form strong side branches. Usually the main stem is reasonably thick and slightly woody. Leaves are hand-shaped, composite, fairly large and slightly hairy consisting of five to eight smaller leaves. The broad leaves are characteristic of the species.

The inflorescence is a bunch of flowers forming spirally around the stem. Flower colours vary between white to blue white, depending on the cultivar. Self-pollination is the main form of pollination, but cross pollination also takes place from time to time.

The pods are much larger than the narrow-leaf lupin pods. Ripe pods do not open easily. Broad leaf lupin cultivars are sweet and have a crude protein content of about 35-37 %. Broad leaf lupins grow well in sandy loam to clay loam soils.

***Lupinus luteus* (yellow lupins)**

The most defining characteristic of yellow lupins is the yellow flower colour and the pleasant scent of the flowers borne in a circle or crown on the stem. Insects, particularly bees, are attracted by the bright yellow colour and sweet scent of the flowers. Cross pollination takes place. Self-pollination also occurs.

The leaves are wider than those of the narrow leaf lupins. They also show more hair. Like broad and narrow leaf lupins, yellow lupins have composite leaves. The stems and branches also appear to be hairy and are less woody than the other species.

Seeds are smaller than those of broad and narrow leaf species. The protein content varies between 38 and 40 %. Only sweet cultivars are grown commercially. Yellow lupins prefer acidic, sandy soil and handle wet conditions better than other lupin types.

Scope of Lupin Cultivation: 1956 – 2007

From 1956 to 1962 lupin cultivation involved mainly bitter, narrow leaf varieties, the area planted increasing during this time from 113 000 to 198 000 ha. Production then decreased slowly to 127 000 ha in 1970 because of the increasing practice of wheat mono-cultures, the sustained increase in wheat prices and fluctuations in wool prices.

In 1971 the popularity of lupins sustained a severe blow due to the sharp decrease in the wool price from 63 to 46 c per kg. The epidemic occurrence of powdery mildew (white mildew) in 1973 almost brought lupin production to a standstill. Between 1974 and 1983 the production area declined to less than 20 000 ha. Since the introduction of white mildew-resistant bitter cultivars in 1984, production gradually increased from about 20 000 ha to 80 000 ha in 1993.

Since 1985, sweet lupin production, particularly of the broad leaf cultivars, gradually expanded. During 1988 the first locally produced sweet, narrow leaf cultivars were launched, leading to increased sweet lupin production.

During 1996, anthracnose was diagnosed in the Western Cape and in the Malmesbury area. As the anthracnose spread, sweet lupin production declined from about 30 000 ha in 1997 to less than 15 000 ha in 1999, because the local sweet cultivars, particularly broad leaf cultivars, were highly susceptible to this disease, and large crop losses were reported.

During a study tour to Australia in 1997, several sweet, narrow leaf cultivars with good anthracnose resistance were identified for local production. Since 2000 these seeds have been available locally, and sweet lupin production has once again increased to about 27 000 ha. Severe drought conditions from 2002 to 2004, coupled with concern about possible anthracnose infection, caused a decline to a meagre 7 000 ha. The area planted to lupins has since increased to about 14 000 ha.

Problem Areas in the Lupin Industry

The lack of a stable market and fair price for sweet lupins seem to be the biggest concern in the current local lupin industry, and this has resulted in bitter lupins being the favoured variety. Also, input costs for bitter lupins are lower than for sweet lupins, while the benefits of crop rotation are the same for both varieties. These benefits include disease prevention, increased wheat production after lupin cultivation and a saving in nitrogen fertilisation in the follow-up crop.

According to estimates, the area under bitter lupin cultivation was about 10 000 - 12 000 ha in 2007. The current high meat prices and increased livestock numbers may also lead to an increase in lupin production because of the important role that this protein source plays in sheep farming, particularly lamb production.

LUPIENVERBOUING IN DIE WES- EN SUID-KAAP

Herman Agenbag

Inleiding

Een van die oudste verwysings van lupienverbouing in Suid-Afrika word gevind in Volume X1 van die Journal of Agriculture, Cape of Good Hope, 1897 waar Mnr J.P. de Waal vergelykings tref tussen blou-, wit- en geelblomtypes. Hy beveel ook aan dat lupiene taamlik dik gesaai en saad vooraf geënt moet word.

Hoewel daar sedert die aanvang van die twintigste eeu baie proewe met lupiene plaaslik uitgevoer is was die vordering in lupieneverbouing baie traag. Boere was bang dat lupiene giftig sou wees vir skape en dat dit ook tot 'n probleem onkruid in koringlande sou ontwikkel.

Eers nadat Mnr C.P. Wagener, 'n onderwyser/boer in die Malmesbury distrik, gedurende die veertigerjare nie-hardskalige plante selekteer en suksesvol as veevoer en wisselbougewas gebruik het, het lupieneverbouing begin toeneem. Teen 1949 is die waarde van lupiene as wisselbougewas en veevoer algemeen deur boere aanvaar en sedertdien bekleed lupiene 'n baie belangrike plek in die boerderystelsels van veral die Swartland. Gebiede soos die Rûens het aanvanklik nie baie baat gevind by lupiene nie aangesien daar op daardie tydstip beter en goed aangepaste weidings- en wisselbougewasse vir daardie area beskikbaar was.

Tabel 1: GEMIDDELDE SAADOPBRENGS (KG/HA) VAN LUPIENE IN DIE SWARTLAND EN RÛENS (1983 – 1996)		
LOKALITEIT	BREËBLAARLUPIENE	SMALBLAARLUPIENE
Rûens	2 818	1 366
Swartland	1 994	1 534
Gemiddelde	2 406	1 450

Tabel 2: CHEMIESE SAMESTELLING VAN LUPIENE (% DROËMATERIAALBASIS)		
	BREËBLAARLUPIENE	SMALBLAARLUPIENE
Ru-proteïen	37.4	31.1
Lisien	1.80	1.50
Metionien	0.27	0.22
Ru-vesel	11.1	13.3
Ca	0.3	0.2
P	0.5	0.3

Spesies

Die belangrikste lupienspesies wat tans kommersieel verbou word is *L.angustifolius* (smalblaar), *L.luteus* (geellupien) en *L.albus* (breëblaar – of witlupien).

***Lupinus angustifolius* (smalblaar lupien)**

Die bekendste eienskap van hierdie spesie is die klein, smal blaartjies waaruit die saamgestelde blaar bestaan. Die plante is blaarryk, met lig-tot donkergroen blare. Blomkleur wissel van blou, pienk, ligroos tot wit. Bitterlupiene se blomme is gewoonlik blou, pienk of ligroos terwyl soetlupiene hoofsaaklik wit is. Die blomme word spiraalgewys op die bloei-as gedra en is selfbestuiwend. Soet- en bitter kultivars kom voor met ru-proteïeninhoud van ongeveer 30-32% by soet kultivars en 28-30% by bitter kultivars. Smalblaarlupiene aard baie goed op sand-tot-sandleemgrond.

***Lupinus albus* (breëblaar lupien)**

Breëblaarlupiene is eenjarig en regop groeiend met 'n sterk penwortelstelsel. Onder gunstige groeitoestande word sterk sytakke gevorm. Die hoofstam is gewoonlik redelik dik en effens houtagtig. Die blare is handvormig, saamgesteld, redelik groot, breed en effens harig. 'n Saamgestelde blaar kan uit vyf (5) tot agt (8) kleiner blaartjies bestaan. Hierdie breëblare is kenmerkend van die spesie en het ook aanleiding gegee tot die naam breëblaarlupien.

Die bloeiwyse is 'n blomtros en die blommetjies word spiraalvormig op die bloei-as gedra. Blomkleure wissel van wit tot blouwit na gelang van die kultivar. Selfbestuiwing vind hoofsaaklik plaas, maar kruisbestuiwing veral deur bye is ook moontlik.

Die peule is baie groter as die van smalblaarlupiene en spring nie maklik oop wanneer dit ryp is nie. Kultivars van breëblaarlupiene is soet met 'n ru-proteïeninhoud van ongeveer 35-37%. Breëblaarlupiene is goed aangepas op sandleem tot kleileemgronde.

***Lupinus luteus* (geellupien)**

Die kenmerkendste eienskap van geel lupiene is die geel blomkleur en aangename aroma van die blomme wat in kringe of kranse op die bloei-as gedra word. Insekte, veral bye word gelok deur die helder geelkleur en soet aroma van die blomme en vind kruisbestuiwing plaas. Selfbestuiwing kom egter ook voor.

Die blare is heelwat breër as die van smalblaarlupiene en ook meer harig. Net soos by breë- en smalblaar lupiene is die blare ook saamgestel. Die stam en stingels vertoon ook soms harig en is minder houtagtig as die van die ander soorte.

Die sade is kleiner as die van breë- of smalblaarsoorte. Die proteïëinhoud wissel van 38-40%. Slegs soet kultivars word kommersieel verbou. Geellupiene verkies suur sanderige grond en kan nat toestande baie beter hanteer as die ander lupiensoorte.

Omvang van lupienverbouing:- 1956 – 2007

Sedert 1956 tot 1962 het lupienverbouing, hoofsaaklik bitter smalblaar, met 85 000 ha toegeneem vanaf 113 000 tot 198 000 ha. Daarna het produksie geleidelik gedaal tot 127 000 ha gedurende 1970 as gevolg van die toenemende praktyk van koringmonokultuur hoofsaaklik weens die volgehoue styging in die koringprys en fluktuasies in die wolprys.

Gedurende 1971 het die gewildheid van lupiene 'n ernstige knou gekry met die skerp daling in die wolprys vanaf 63 tot 46c per kilogram. Die epidemiese voorkoms van poeieragtige meeldou (witroes) gedurende 1973 het lupieneverbouing feitlik totaal tot stilstand geruk. Produksie het sedert 1974 tot 1983 gedaal tot minder as 20 000 ha. Sedert die vrystelling van bitter kultivars met witroesweerstand gedurende 1984 het produksie geleidelik begin toeneem van ongeveer 20 000 ha tot 80 000 ha gedurende 1993.

Sedert 1985 het soetlupienverbouing, veral breëblaar kultivars, geleidelik begin uitbrei. Gedurende 1988 is die eerste plaaslik geteelde soet smalblaar kultivars vrygestel wat soetlupienverbouing verder laat styg het.

Gedurende 1996 is antraknose in die Wes-Kaap waargeneem in die Malmesbury-area. Namate antraknose verder versprei het, het soetlupieneproduksie sedert 1997 gedaal vanaf ongeveer 30 000 ha tot onder 15 000 ha gedurende 1999 aangesien die plaaslike soet kultivars, veral breëblaar, baie vatbaar is en groot oesverliese ondervind is.

Tydens 'n studie-toer na Australië gedurende 1997 is etlike soet smalblaar kultivars met goeie antraknose weerstand geïdentifiseer vir plaaslike produksie. Sedert 2000 was saad van hierdie kultivars plaaslik beskikbaar en het soetlupiene verbouing weer gestyg tot 27 000 ha. Ernstige droogte toestande gedurende 2002 tot 2004 tesame met 'n vrees vir antraknose het produksie laat daal tot 'n skamele 7 000 ha. Sedert 2005 het verbouing weer begin styg tot 14 000 ha.

Knelpunte in die lupienebedryf

Tans is 'n gebrek aan 'n stabiele mark teen 'n billike prys vir soetlupiene sekerlik die grootste knelpunt in die plaaslike lupienebedryf.

Weens 'n gebrek aan 'n mark en swak pryse vir soetlupiene is daar 'n algemene swaai van soetlupiene na bitterlupiene.

Insetkoste van bitterlupiene is minder as die van soetlupiene terwyl dieselfde wisselbou voordele soos siektebreek, verhoging in koringopbrengs na lupiene, asook besparing op stikstofbemesting by opvolg-gewas met bitterlupiene verkry word.

Volgens raming beloop bitterlupiene verbouing in 2007 alreeds ongeveer 10 000 - 12 000 ha. Die heersende hoë vleispryse en groei in veegetalle sal dus ook 'n toename in lupieneproduksie meebring weens die belangrike rol wat lupiene in skaapvleisproduksie speel.