Effect of graded shading on the essential oil composition of an endangered medicinal herb *Valeriana jatamansi*



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The Plant

- *Valeriana jatamansi* (syn. *V.wallichii)*
- A perennial rhizomatous herb
- Family :Valerianaceae
- Known for aromatic & medicinal importance

The Products







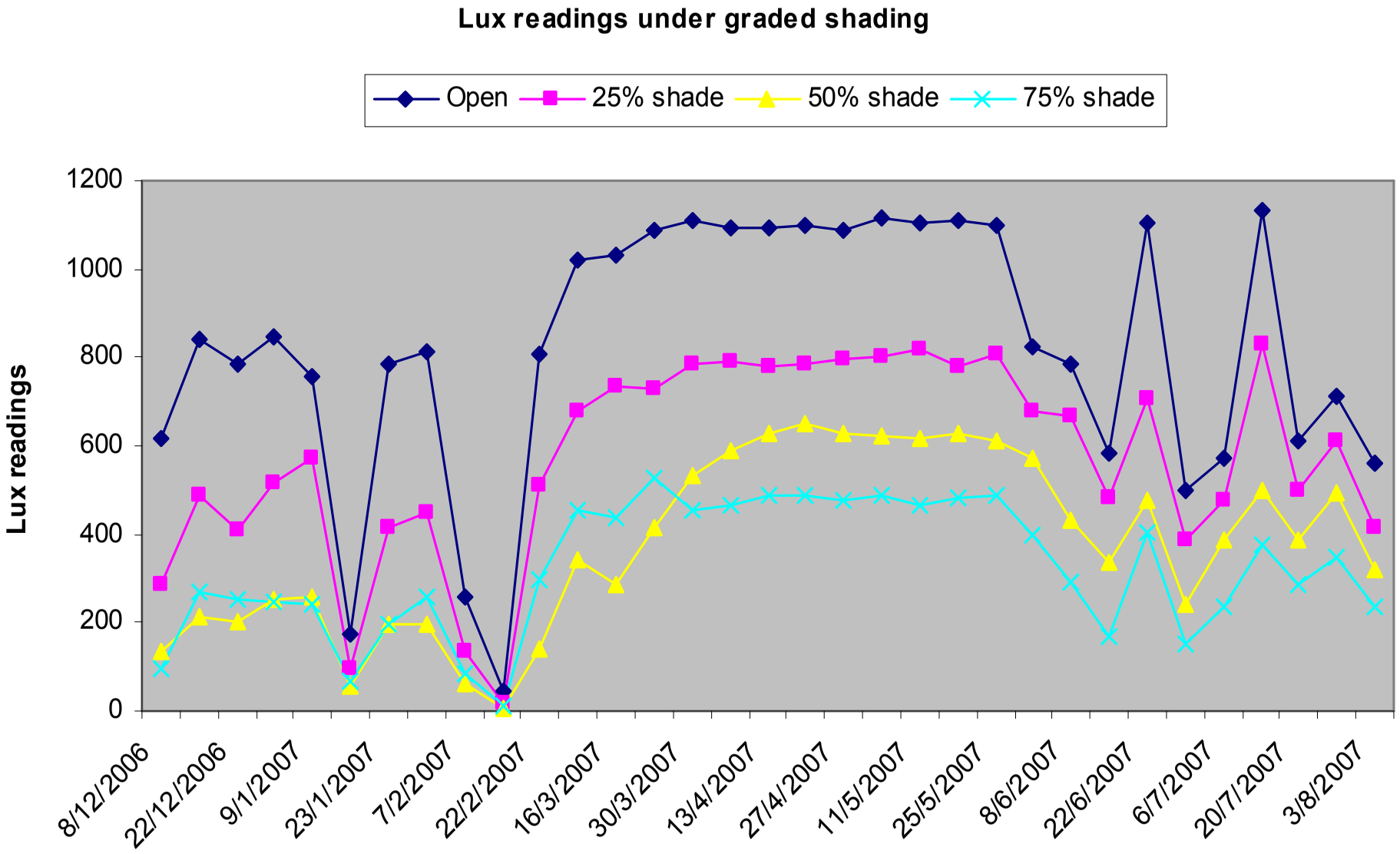
The Problem

- An endangered understorey herb
- Need for cultivation
- Pure cropping
- Shading
- Industrial demand for specific compounds

How attempted ?

- Field experiment* during 2005-07 to study the effect of shading (Open, 25% shade, 50% shade and 75% shade) & pinching (pinched and unpinched)
- 45 days old seedlings
- Root, rhizome and leaves harvested at 18 MAT was hydro-distilled (Clevenger apparatus)
- Oil analysis (GC/MS BP-20 column)
- Compounds identification by Retention indices (RI) mass spectral libraries viz., wiley, NIST etc

*** Location: 76°33′29″ E; Longitude, 32°6′20″ N ; Altitude1300 m amsl**


Lux readings under graded shading
Open
25% shade
50% shade
75% shade
Lux readings
1200
1000
800
600
400
200
0
8/12/2006
22/12/2006
9/1/2007
23/1/2007
7/2/2007
22/2/2007
16/3/2007
30/3/2007
13/4/2007
27/4/2007
11/5/2007
25/5/2007
8/6/2007
22/6/2007
6/7/2007
20/7/2007
3/8/2007

RESULTS

Effect of shading on fresh biomass yield

Shade	Yield (q/ha)		
	Rhizome	Root	Leaf
Open	17.2	14.0	52.5
25%	18.6	17.7	55.8
50%	24.8	21.9	70.0
75%	22.9	17.7	35.8
SEm±	2.07	1.85	8.10

RESULTS

Effect of shading on essential oil* content (%)

Treatment	Rhizome	Root	Leaf
Open	0.033	**0.175**	0.005
25% shade	0.104	0.126	0.005
50% shade	**0.225**	0.158	0.005
75% shade	0.046	0.142	0.005
SEm±	0.05	0.01	

* Fresh weight basis


Major quality constituents
Patchouli alcohol
Maaliol

Effect of shading on root oil composition

Compound	Content (%)			
	Open	25% Shade	50% Shade	75% Shade
dl-Limonene	0.64	0.27	0.34	0.2
β- Phellandrene	0.27	0.16	0.17	-
γ-terpinene	0.42	0.15	0.24	-
β- Patchoulene	0.78	1.07	0.78	0.53
α- Guaiene	0.65	8.61	10.87	15.54
Aromadendrene	0.36	0.33	0.38	0.43
β- elemene	5.86	15.63	4.37	1.46
Caryophyllene	0.84	1.215	1.66	2.23
Farnesol	0.22	0.36	0.34	0.38
α- Gurjumene	1.29	1.32	1.29	1.3
Patchoulene	1.39	2.42	1.62	1.89
α- Humulene	0.63	0.98	0.59	1.23
γ- Curcumene	0.42	0.53	0.47	0.42
Myrtenyl acetate	1.17	1.76	1.78	0.29
β- Kassane	0.65	0.51	0.25	0.72
Maaliol	23.56	21.68	25.74	25.22
Patchouli alcohol	28.07	17.18	22.85	12.19
Bisabolol	1.04	0.57	0.88	0.44
Muurol	1.22	0.86	1.01	0.7
Valerianol	0.255	0.25	0.29	0.29

Effect of shading on rhizome oil composition

Compound	Content (%)			
	Open	25% Shade	50% Shade	75% Shade
dl-Limonene	0.32	0.26	0.17	0.1
β- Patchoulene	0.76	1.0	1.3	0.43
α- Guaiene	0.60	0.20	3.0	4.11
Aromadendrene	0.36	0.38	0.34	0.29
β- elemene	8.22	7.07	3.49	0.93
Caryophyllene	0.61	0.62	1.28	1.56
Farnesol	0.17	0.33	0.17	0.23
α- Gurjumene	0.85	0.73	0.84	0.40
Patchoulene	3.11	10.17	6.25	-
α- Humulene	0.64	0.58	0.51	0.36
γ- Curcumene	0.15	0.31	0.19	0.19
Myrtenyl acetate	0.60	0.80	0.60	0.52
β- Kassane	0.60	0.44	0.30	0.29
Maaliol	30.44	27.54	25.80	31.8
Patchouli alcohol	25.24	19.37	25.38	13.83
Bisabolol	0.96	0.75	0.99	0.53
Muurol	1.24	0.97	1.12	0.38
Valerianol	0.26	0.46	0.39	0.15

Effect of shading on leaf oil composition

Compound	Content (%)			
	Open	25% Shade	50% Shade	75% Shade
β- Patchoulene	0.86	-	1.04	0.26
α- Guaiene	8.12	6.89	8.13	9.36
Caryophyllene	0.31	0.74	0.74	1.02
α- Gurjumene	0.75	0.25	0.88	0.50
Patchoulene	1.51	1.88	3.18	3.62
α- Humulene	0.20	-	-	0.19
β- Kassane	0.89	1.55	1.72	1.59
Maaliol	18.50	13.29	14.61	23.54
Patchouli alcohol	21.38	6.86	12.34	6.63
Bisabolol	0.87	0.73	0.97	1.03
Muurol	0.55	0.50	0.74	0.65
Valerianol	0.27	2.75	3.46	2.97

Conclusion

- Fifty per cent shading was found to be the best for
  - 1) Biomass yield
  - 2) Essential oil content &
  - 3) Quality point of view
- Leaf can also be harvested
- Pathway need to be studied further
- Valepotriate contents need to be studied in subterranean parts as well as aerial parts

Thank You