Guar: From India to New Mexico

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What is guar?

- Guar or cluster bean (*Cyamopsis tetragonoloba*) is a drought tolerant legume crop traditionally grown for centuries in south Asia including India.
- The word "**Guar**" comes from Hindi, meaning "**cow food**".

What is guar?

- Guar can be grown for protein-rich high quality forage for animals or
- can be grown for fresh pods for vegetables, or
- for seed to produce guar gum.

Guar in India

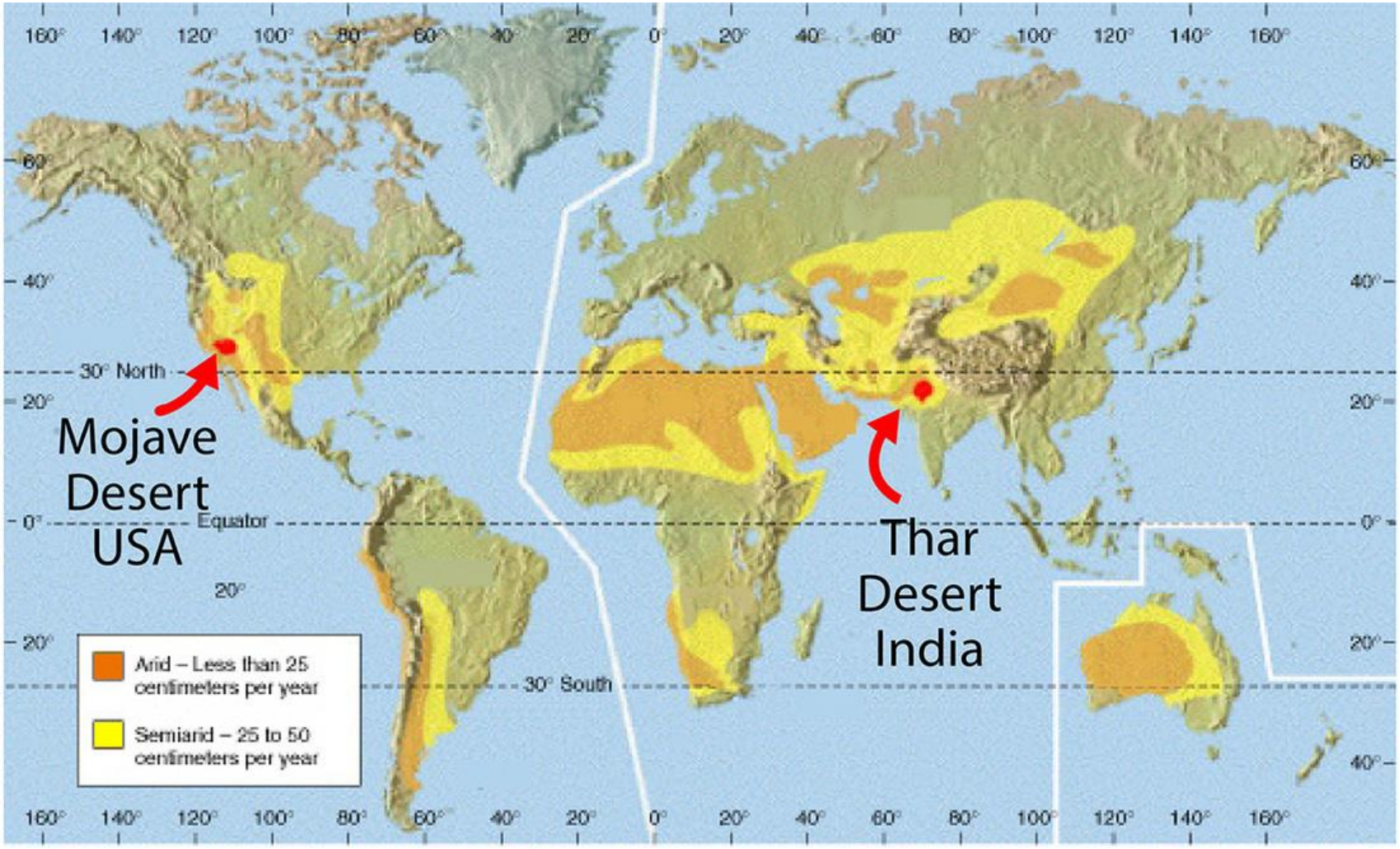
- A poor man's crop
- Grown on marginal, poor quality desert lands mostly in arid regions of India in northwest, west and southern states.

https://www.beautifulworld.com/asia/india/thar-desert/

Guar in India

- Major production area= Thar desert area in Rajasthan state of India bordering with Pakistan.
- Gujrat, Haryana, Punjab

https://www.beautifulworld.com/asia/india/thar-desert/



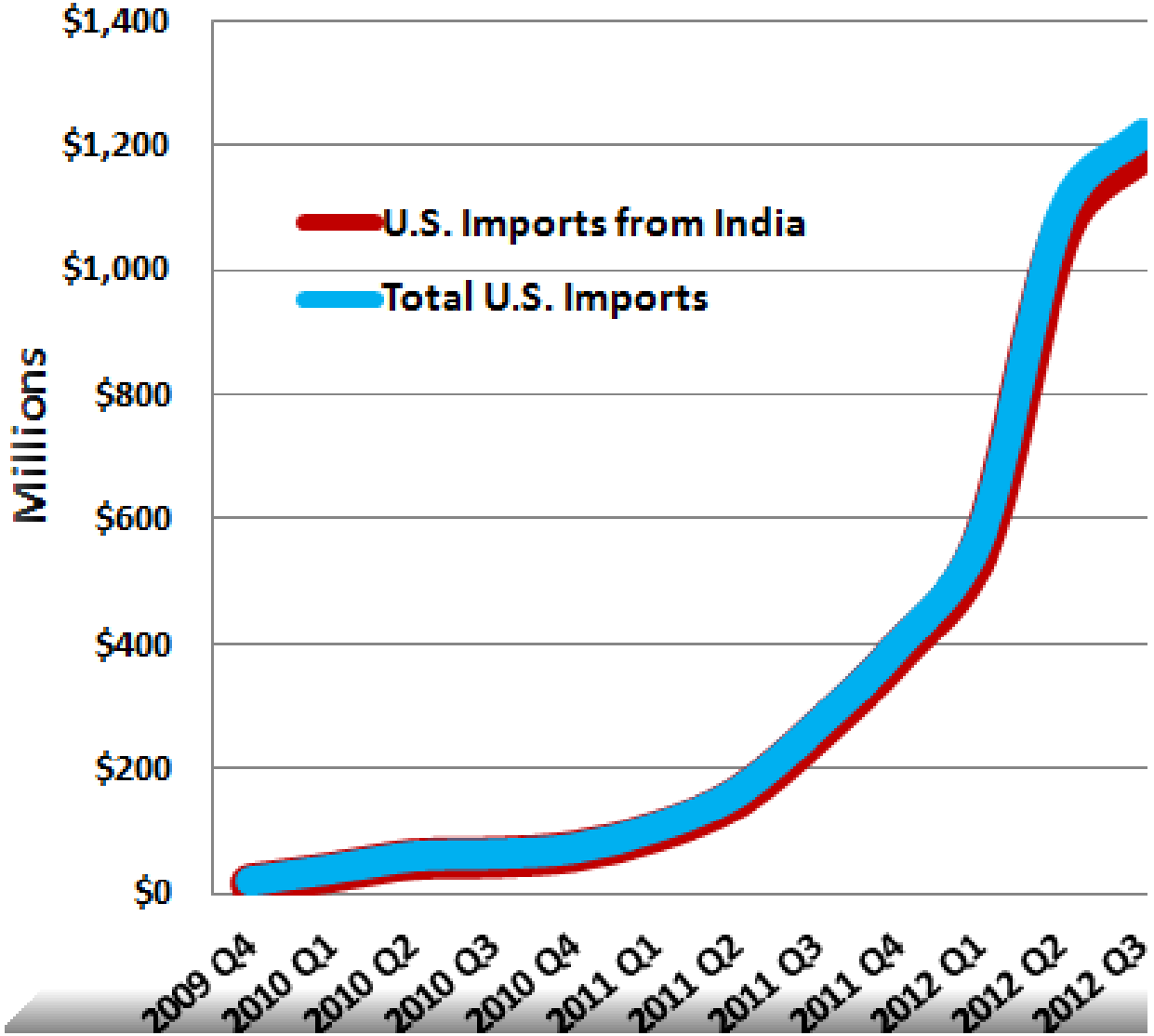
Location of Mojave Desert of southern Nevada, USA and the Thar Desert of Rajasthan, India.
Both of these desert are in the typically arid portion of the planet, thirty degrees on either side of the equator.

Source: http://skydanceblog.weebly.com/maps.html

US Reliance on Imports of guar from India

- US is the biggest user of guar gum
- Most of the guar needs are met through imports
- India tops the list of countries from which US oil industry imports guar products

Guar gum imports



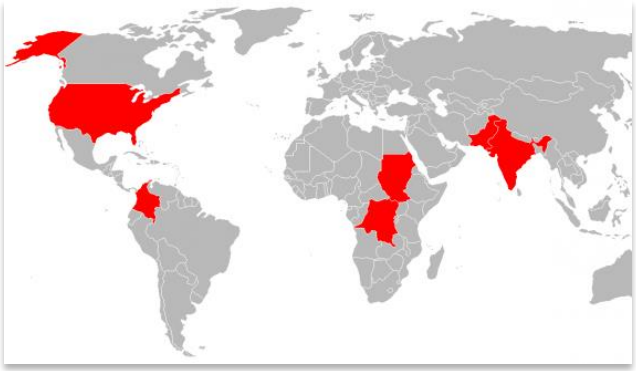
Source: http://www.zepol.com/blog/category/General.aspx?page=18

Growing guar in New Mexico

- Low water needs
- Drought tolerant
- In southern NM, with supplemental irrigation

Growing guar in New Mexico

- Guar can be adapted to semi-arid region of New Mexico due to its ability to tolerate heat and water stress.
- Preliminary Research at NMSU shows its adaptability



Guar gum testing in lab

Response of guar to planting dates in southern New Mexico

- Singla, S., **K. Grover**, S. Angadi, B. Schutte, D. VanLeeuwen. 2016. Guar stand establishment, physiology and yield responses to planting dates in southern New Mexico. *Agronomy Journal* 108(6), 2289-2300.

Seed measurements in lab

Table 1. Photosynthetic rate (P_n), leaf area index (LAI), and SPAD value of eight guar genotypes under four planting dates as measured at 50% flowering stage at Las Cruces, NM in 2014 and 2015.

Planting date (P)	2014				2015		
	P_n (µmol m^{-2} sec^{-1})	LAI	SPAD Value		P_n (µmol m^{-2} sec^{-1})	LAI	SPAD Value
late-April	30.7b†	4.9ab†	69.9b		30.4b	4.8b	61.7b
mid-May	27.6c	4.4bc	52.2c		32.5ab	4.5b	58.0b
mid-June	33.2a	6.1a	83.4a		35.0a	6.2a	74.5a
early-July	22.7d	3.5c	49.1c		30.9b	3.4c	51.8c
Genotype (G)							
HES 1123	28.1a	4.2bc	60.8a		32.1a	3.9c	61.2a
Kinman	28.1a	5.5a	64.7a		31.8a	5.2a	60.5a
Lewis	28.3a	4.1c	64.8a		33.3a	5.2a	63.1a
Matador	29.7a	4.9ab	66.3a		32.2a	5.3a	62.9a
NMSU-15-G1	28.2a	5.2a	66.2a		31.8a	5.5a	61.7a
NMSU-15-G2	29.3a	4.8abc	62.9a		31.8a	4.2bc	62.3a
NMSU-15-G3	27.9a	4.8abc	60.7a		32.1a	4.4b	59.2a
NMSU-15-G4	28.7a	4.4bc	62.8a		32.7a	4.2bc	61.4a
P × G	ns‡	ns	ns		ns	ns	ns

†Means within a column and particular effect followed by the same letter do not differ at α = 0.05.
‡ns, not significant

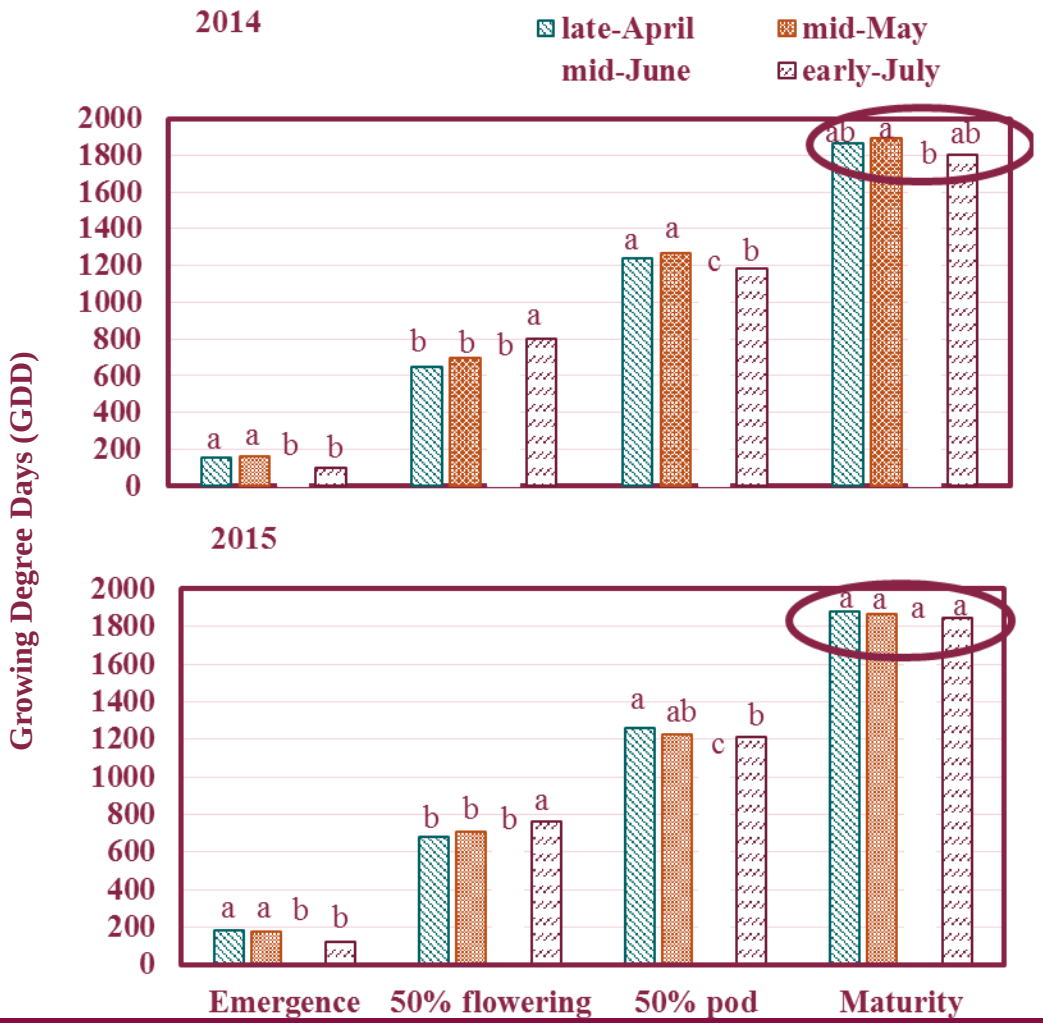
Table 2. Seeds per plant, seeds per pod and 1000 seed weight of eight guar genotypes at maturity under the four planting dates at Las Cruces, NM in 2014 and 2015.

Planting Date	Clusters per plant		Seeds per pod		1000 seed weight (g)	
	2014	2015	2014	2015	2014	2015
late-April	43.5ab†	42.0ab	6.7a	6.6b	25.9a	26.0ab
mid-May	34.6b	37.2bc	8.3a	7.9a	26.2a	22.7ab
mid-June	62.3a	60.6a	7.2a	7.5ab	29.9a	28.1a
early-July	12.5c	16.8c	4.2b	5.3c	26.9a	20.7b
Genotype						
HES 1123	35.5a	33.5b	5.3a	7.6a	26.7a	25.2abcd
Kinman	42.1a	42.2ab	6.4a	6.0b	32.5a	26.8abc
Lewis	34.0a	39.0ab	7.1a	6.2ab	25.7a	19.5cd
Matador	39.2a	40.2ab	7.6a	6.7ab	29.4a	24.0abcd
NMSU-15-G1	43.0a	46.0a	6.3a	6.7ab	32.8a	31.6a
NMSU-15-G2	33.6a	36.7ab	7.0a	6.5ab	21.6a	18.0d
NMSU-15-G3	36.2a	33.2b	6.1a	7.6a	22.8a	28.2ab
NMSU-15-G4	42.4a	42.5ab	7.0a	7.2ab	26.4a	21.5bcd
Planting Date × Genotype	NS	NS	NS	NS	NS	NS

†Means within a column and particular effect followed by the same letter do not differ at α = 0.05.
‡ns, not significant

Growth stages of guar

Figure 2. Mean comparison of growing degree days (GDD) guar needs to reach four growth stages under four planting dates across eight genotypes at Las Cruces, NM in 2014-2015.



Means within a growth stage followed by the same letter are not significantly different at α = 0.05

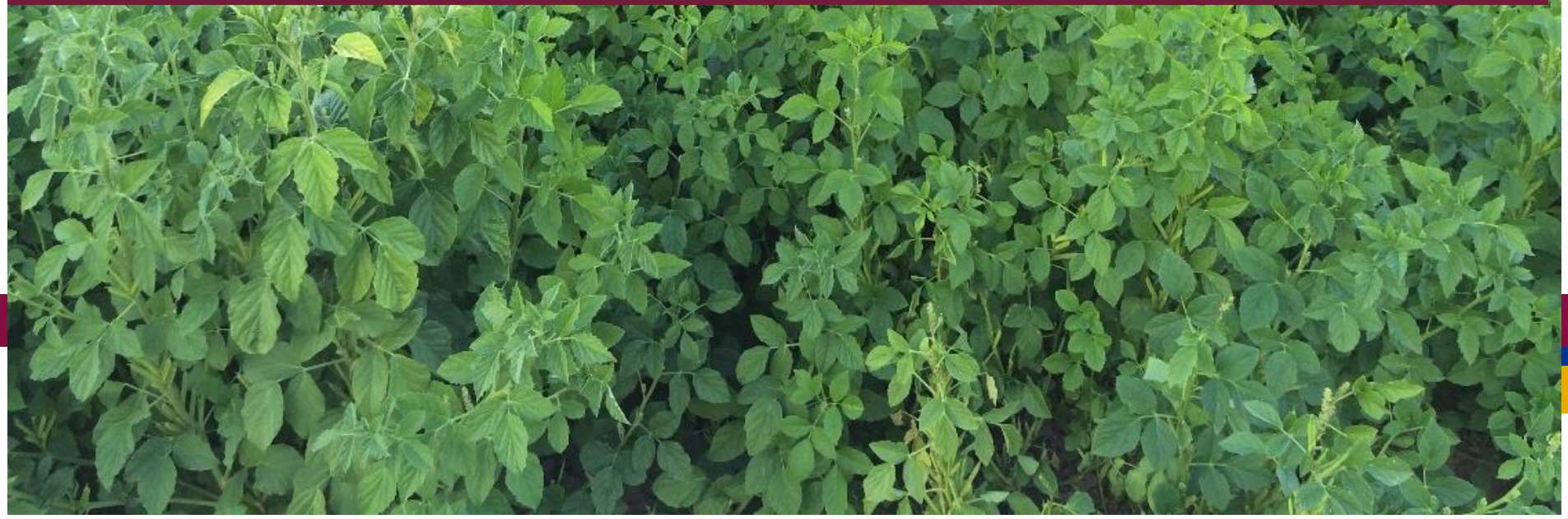
Nodulation observations

Guar at Clovis in eastern New Mexico

- Singla, S., **K. Grover**, S. Angadi, S. Begna, B. Schutte, D. VanLeeuwen. 2016. Growth and yield of guar (*Cyamopsis tetragonoloba L.*) genotypes under different planting dates in the semi-arid southern high plains. American J. Plant Sciences 7(8):1246-1258.

Summary

- Guar can be grown successfully in New Mexico
  - Seed yield differs from region to region
- Guar planted in June performed better than other plantings under both locations
- Guar genotypes performance differ depending upon planting time



Interest of international researchers in guar


Thanks!
Questions?