



Gene technology and the world of traits

The science of GM Plants



Finding the right gene(s)



To learn and adapt



Acknowledgement

Cited Literature and Images

Sunilkumar et al., PNAS 2006
 Abdurakmanov et al., Nature Communications 2014
 Zao et al., New Phytologist 2018
 Gao et al., Front Plant Sci. 2017
 Devendra Pandeya et al. PNAS June 4, 2018
 Ayesha Latif et al. BMC Res Notes. 2015; 8: 453
 British Society for Gene and Cell Therapy
 Genetic Literacy Project
 NASA
 Wikipedia

PPH:

Cell elongation:
 Umid Shapulatov
 Mark van Hoogdalem

Volatile emissions:
 Iris Kappers

COTTON RESEARCH 2018



Australian Cotton Conference 2018



Sander van der Krol, Lab. of Plant Physiology, Wageningen University, The Netherlands



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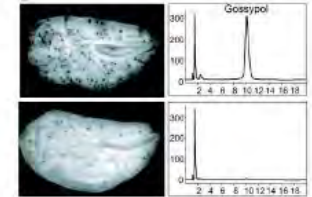
To learn and adapt



THE SCIENTIFIC



1987 GM Cotton

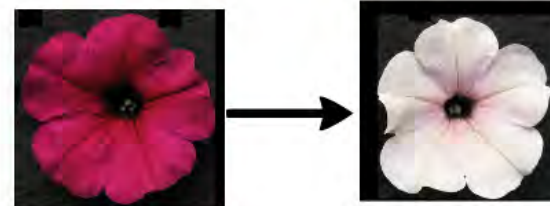


low Gossypol cotton see Sunilkuman et al 2006



1982 Add gene

1988 Inhibit gene



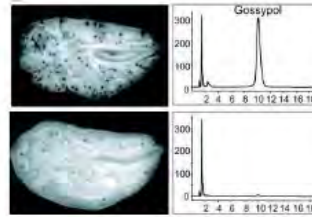
antisense > RNAi



Craig C. Mello Andrew Fire
RNAi 2006



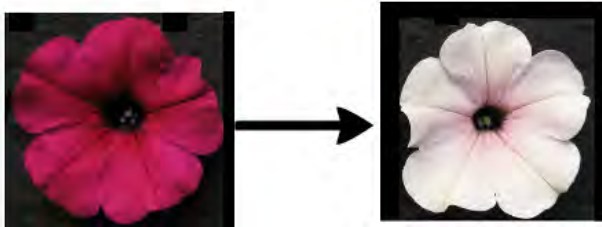
1987 GM Cotton



low Gossypol cotton seed
Sunilkuman et al 2006

1982 Add gene

1988 Inhibit gene

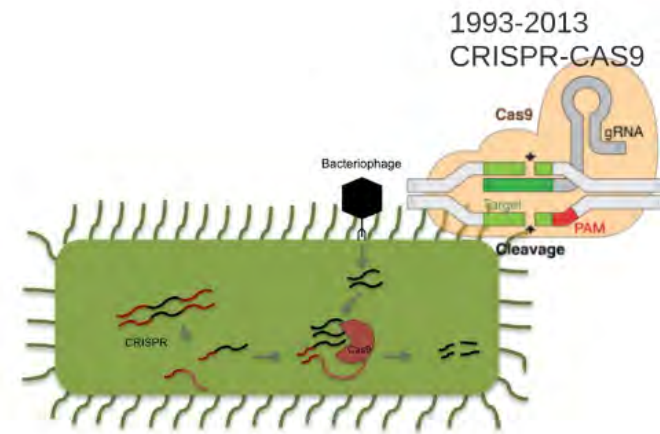


antisense > RNAi



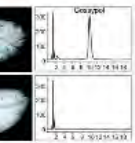
Craig C. Mello RNAi
Andrew Fire 2006

2013 Re



1993-2013
CRISPR-CAS9

ance of GM Plants



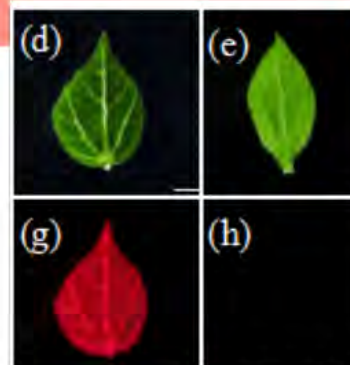
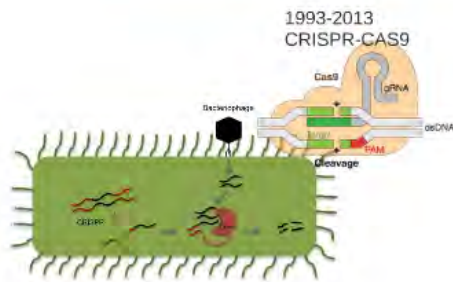
ypol cotton seed
an et al 2006

gene

2013 Rewrite gene



Andrew Fire
2006

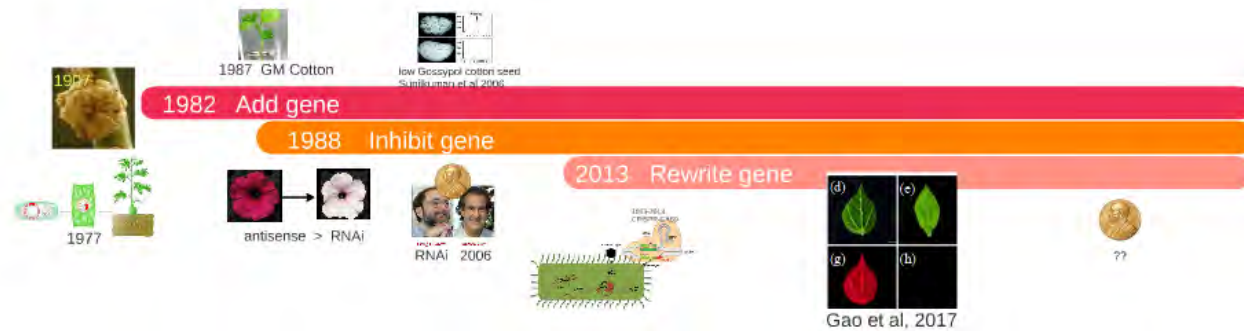


Gao et al, 2017

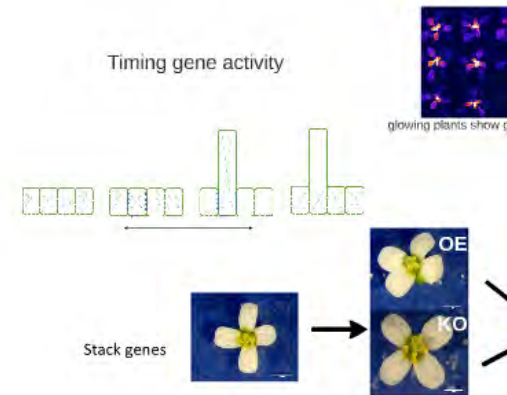
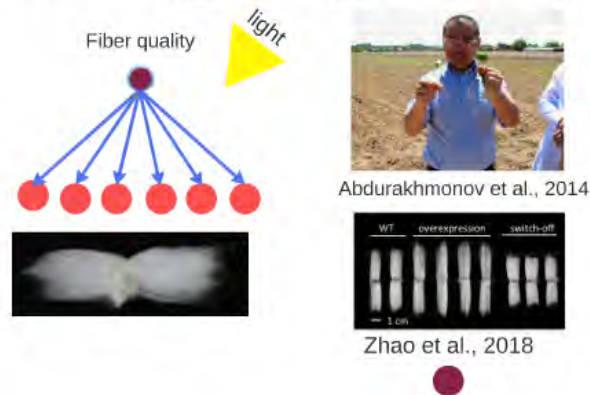


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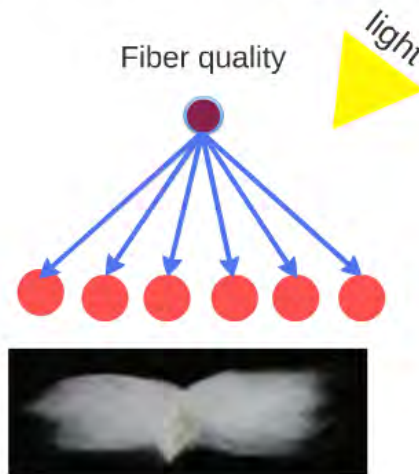
Finding the right gene(s)





Finding the right gene(s)

pest resistance



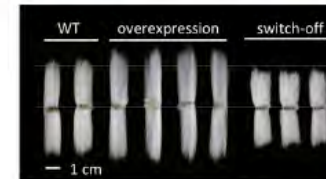
Abdurakhmonov et al., 2014

herbicide resistance



Adapted from: Ayesha Latif et al. BMC Res Notes, 2015

Adapted from: Devendra Pandeya et al. PNAS, 2018



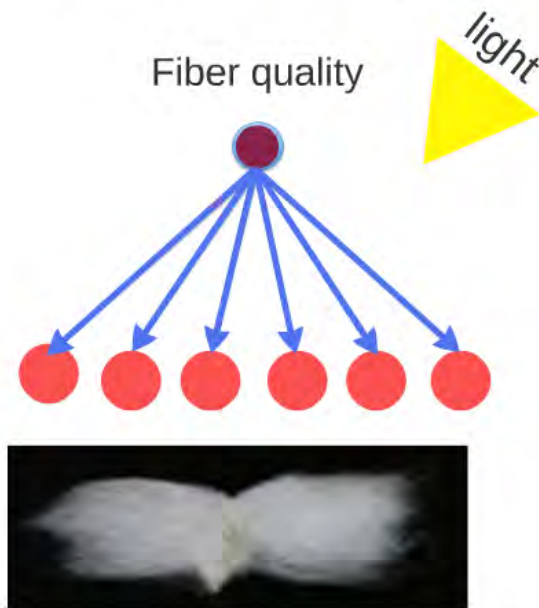
Zhao et al., 2018



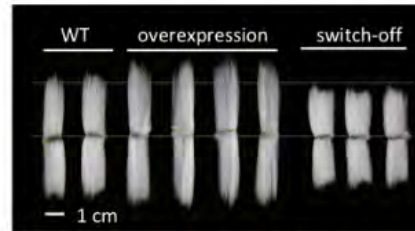
Ti

Stack

the right gene(s)



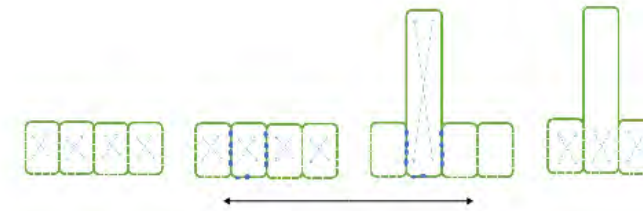
Abdurakhmonov et al., 2014



Zhao et al., 2018



Timing gene activity



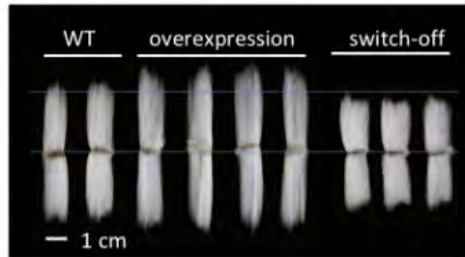
Stack genes



gene(s)



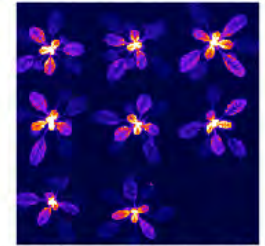
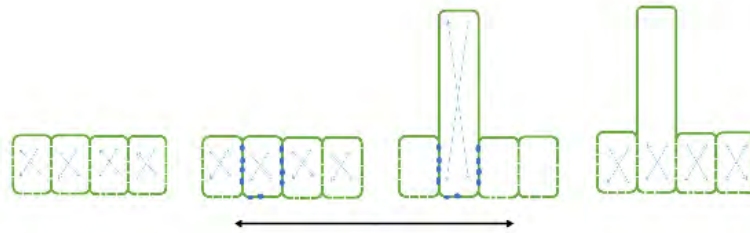
Abdurakhmonov et al., 2014



Zhao et al., 2018

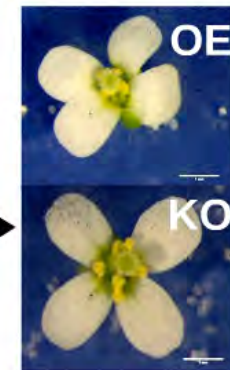


Timing gene activity



glowing plants show gene activity

Stack genes

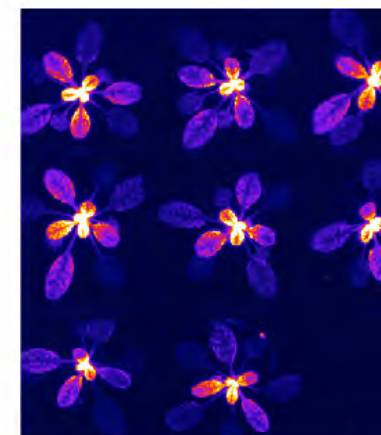




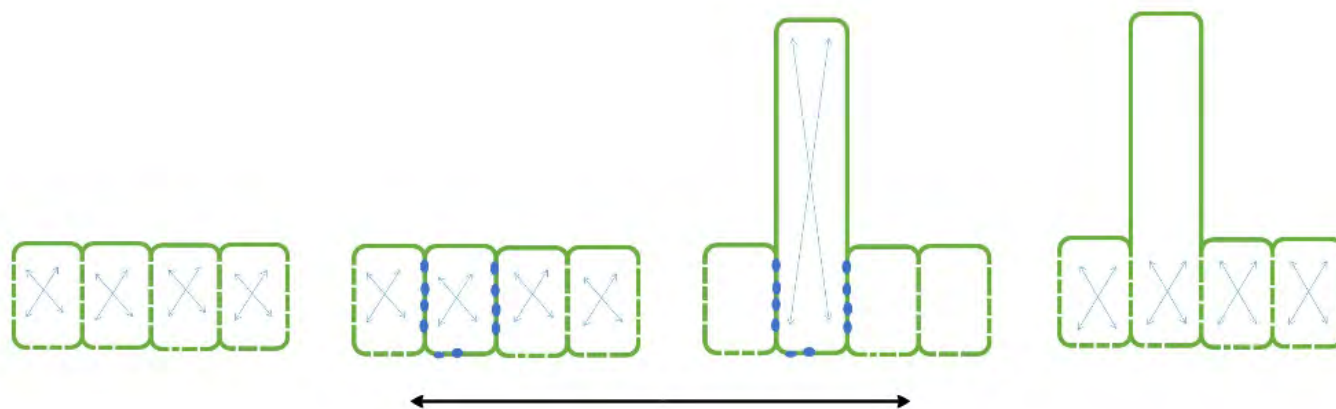
glowing plants show gene activity



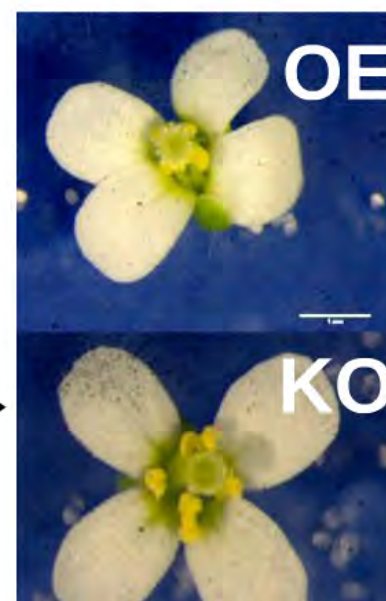
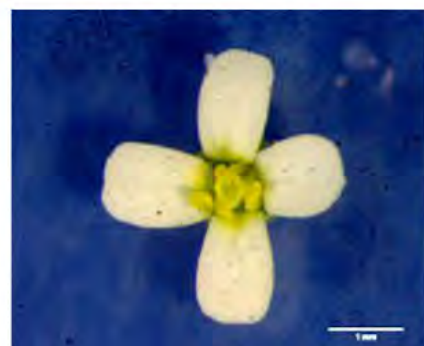
Timing gene activity



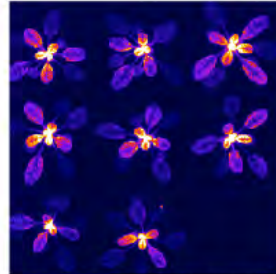
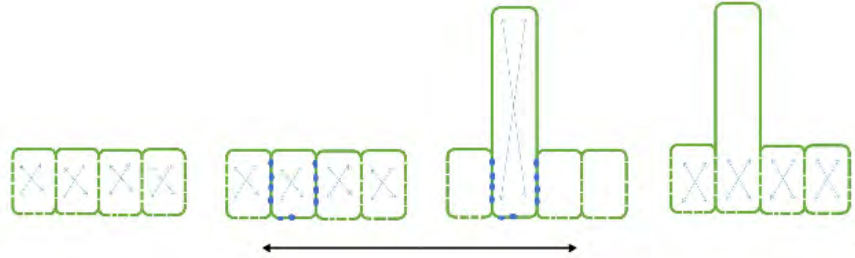
glowing plants show gene activity



Stack genes

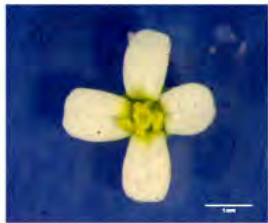


Timing gene activity



glowing plants show gene activity

Stack genes



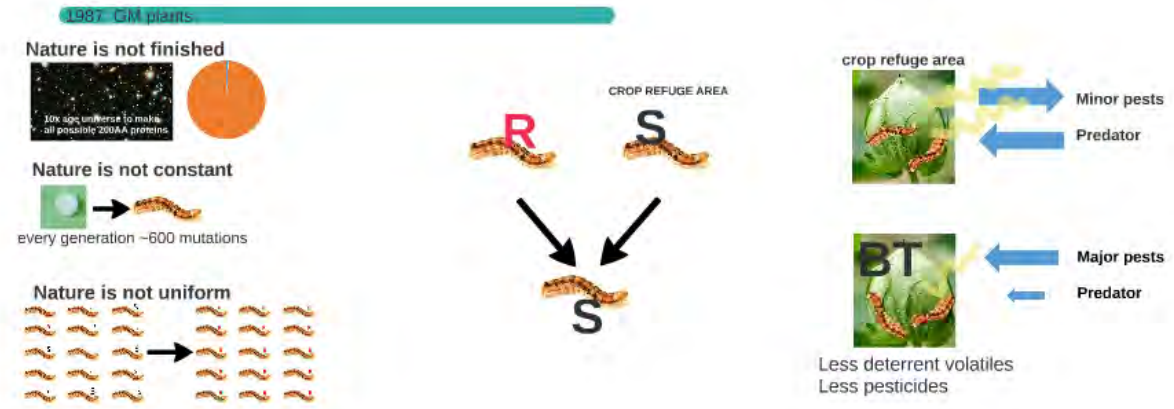
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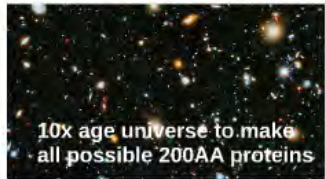
To learn and adapt



To learn and adapt

1987 GM plants

Nature is not finished

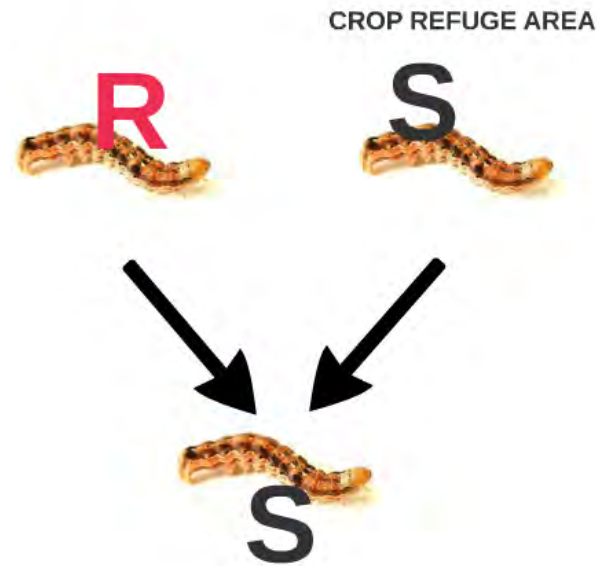
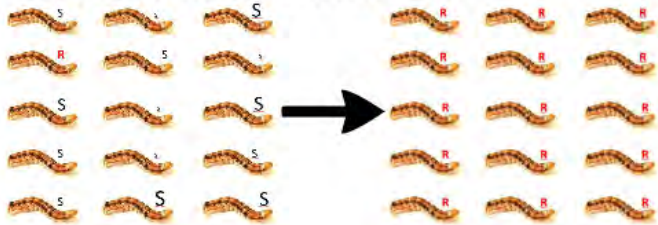


Nature is not constant



every generation ~600 mutations

Nature is not uniform

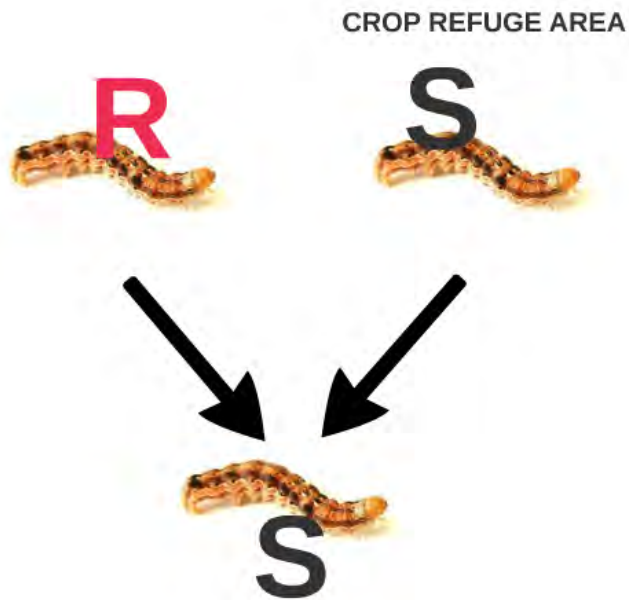


crop refuge area



Less deterrent
Less pesticide

adapt



crop refuge area



Minor pests

Predator

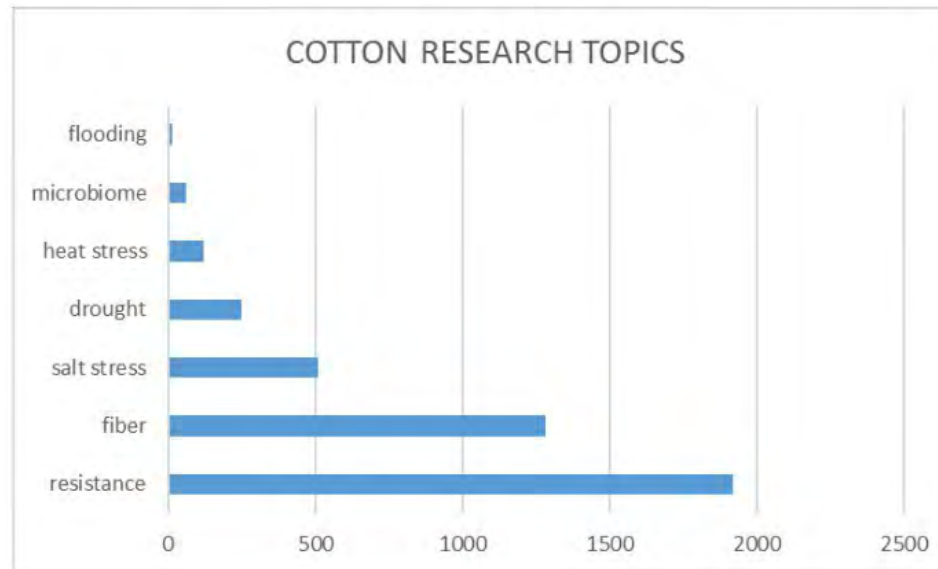


Major pests

Predator

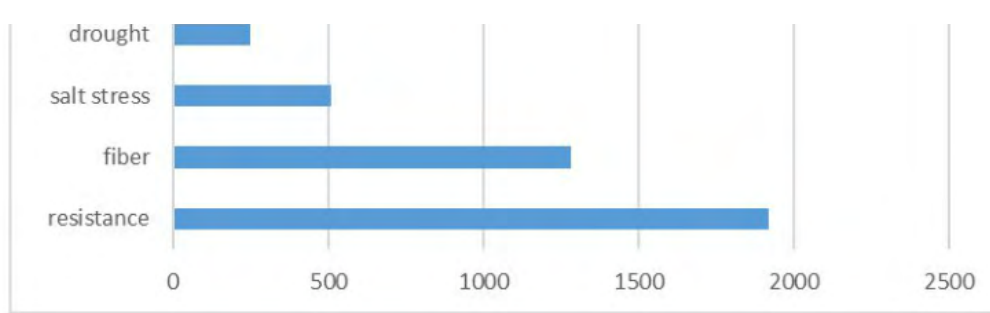
Less deterrent volatiles
Less pesticides

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in middle of giant leap to bigger and better things





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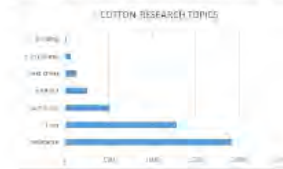
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