

Fate of biocides used in the leather industry and their environmental impact

- Wenkai Zhang, Research Technician, LASRA



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**INTERNATIONAL UNION OF LEATHER
TECHNOLOGISTS AND CHEMISTS SOCIETIES**

Young Leather Scientist Awards 2020
Sustainability/environmental grant

When biocide is needed

Stages when skin/hide are stored, transported
before processing to finished leather

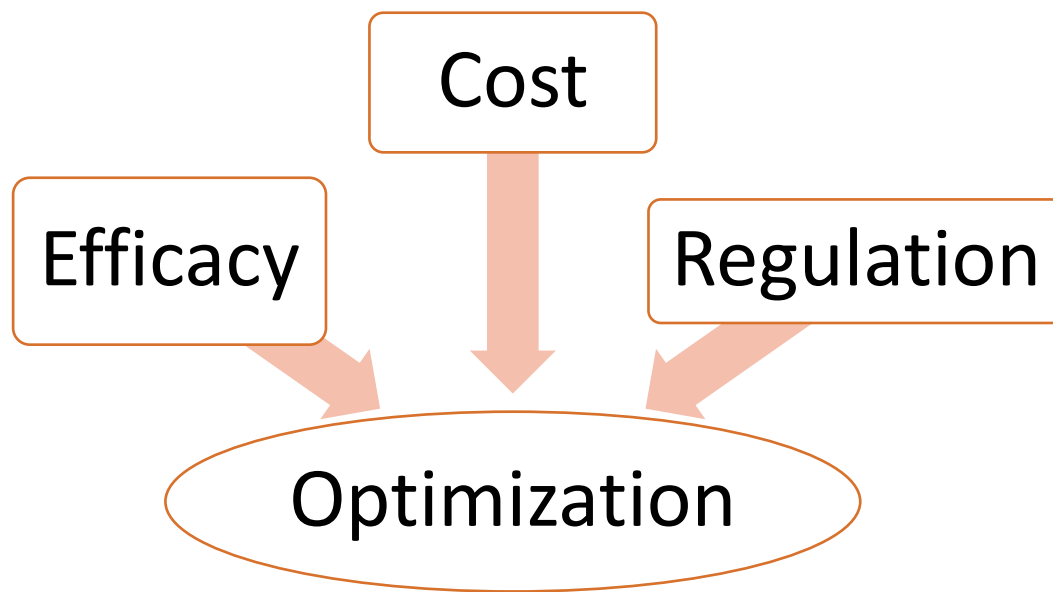


Cured skin

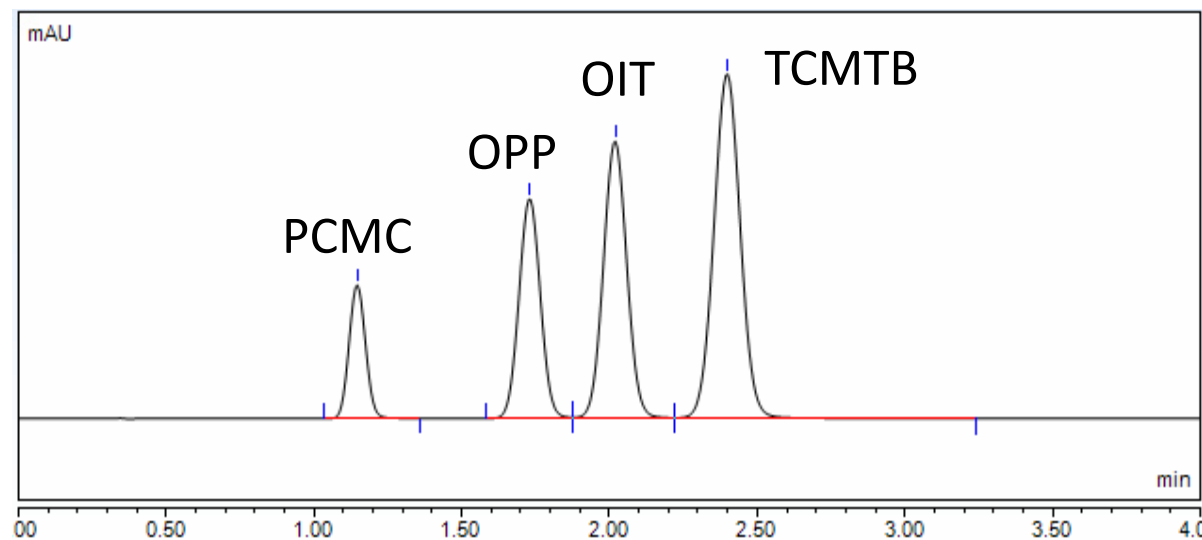
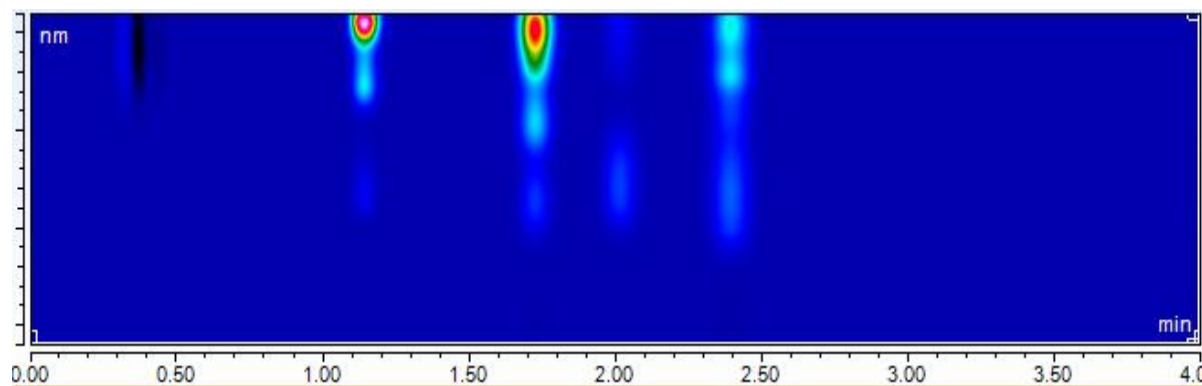


Wet leather

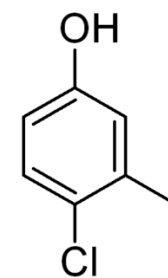
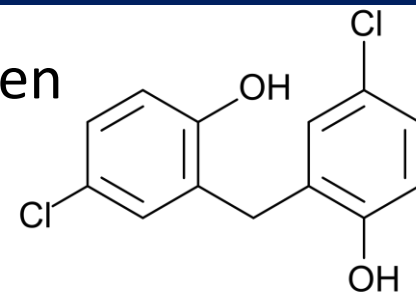
The need to optimize fungicide use



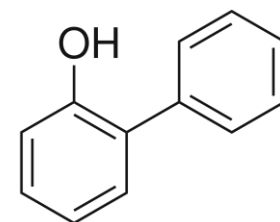
The chemical analysis: ISO 13365



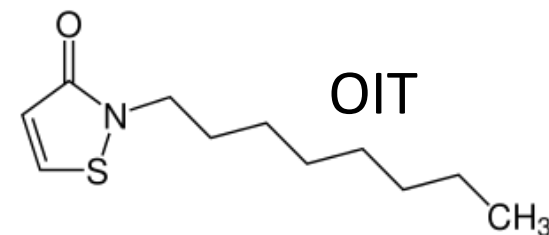
Dichlorophen



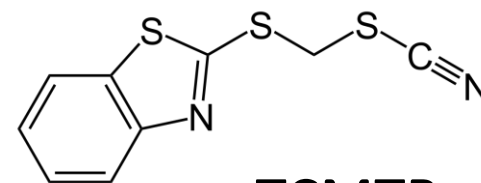
PCMC



OPP



OIT



TCMTB

Retention of biocides applied to cured skin after liming and deliming

Dichlorophen
PCMC
OPP



NaHS
Na₂S
unhairing

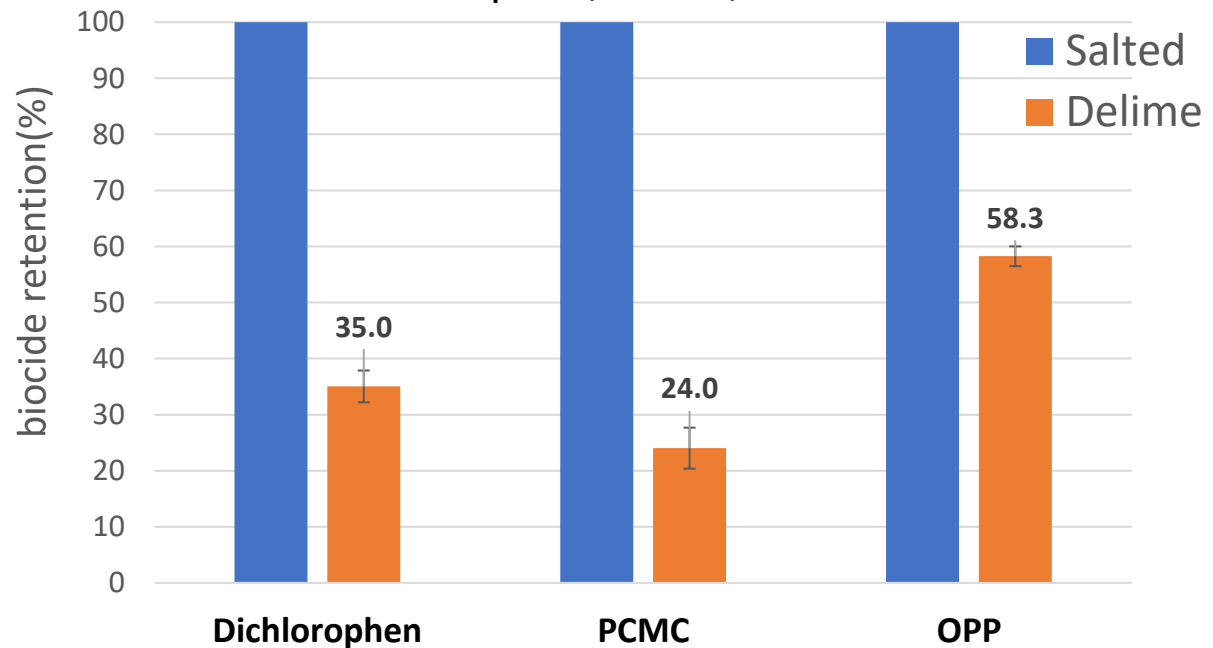
NaOH
Ca(OH)₂
liming



NH₄Cl
deliming

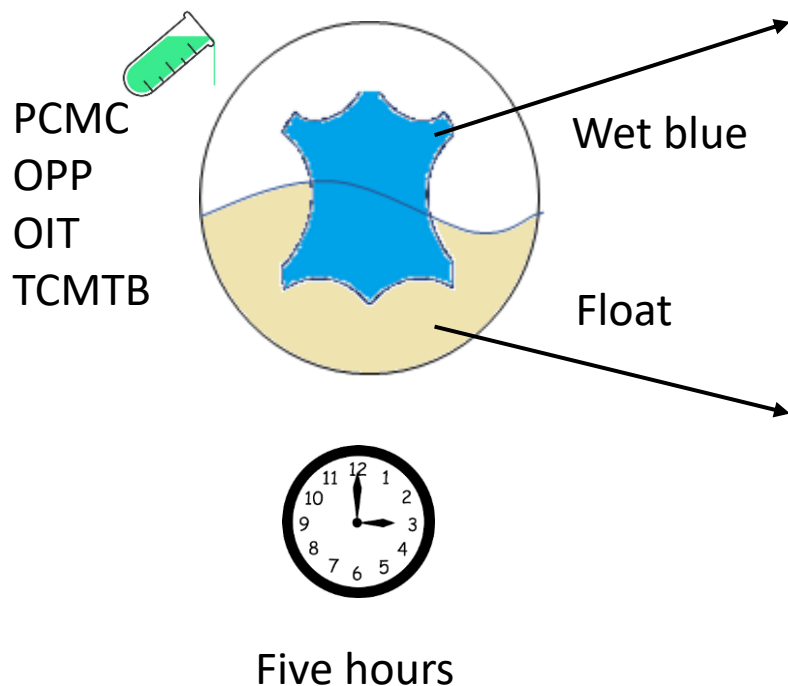


Test for dichlorophen, PCMC, OPP

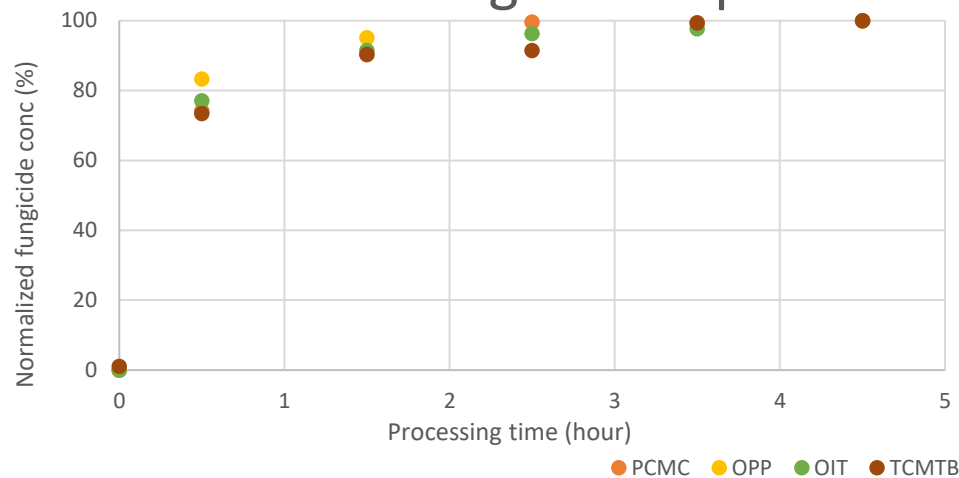


About 35% dichlorophen, 24% PCMC, 58% OPP applied to cured skin was retained in the delime.

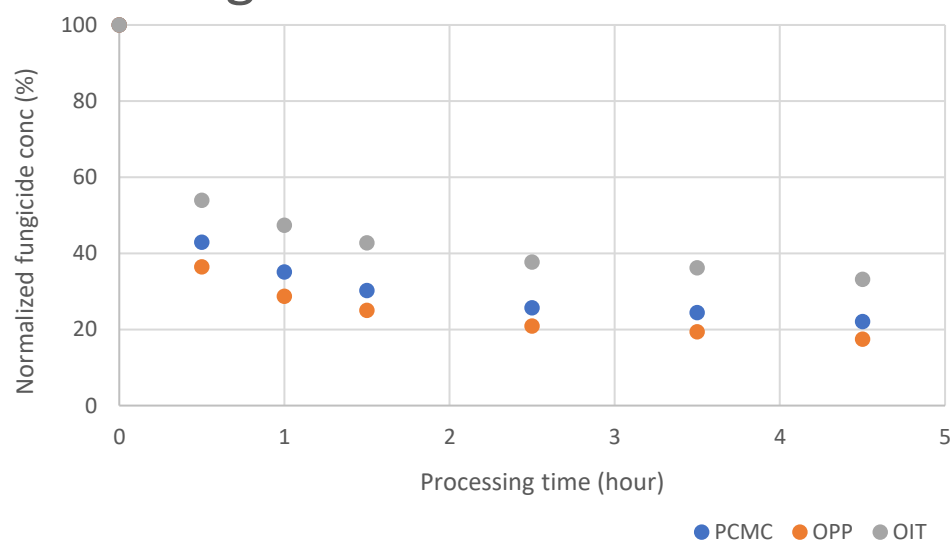
Fungicides uptake experiment



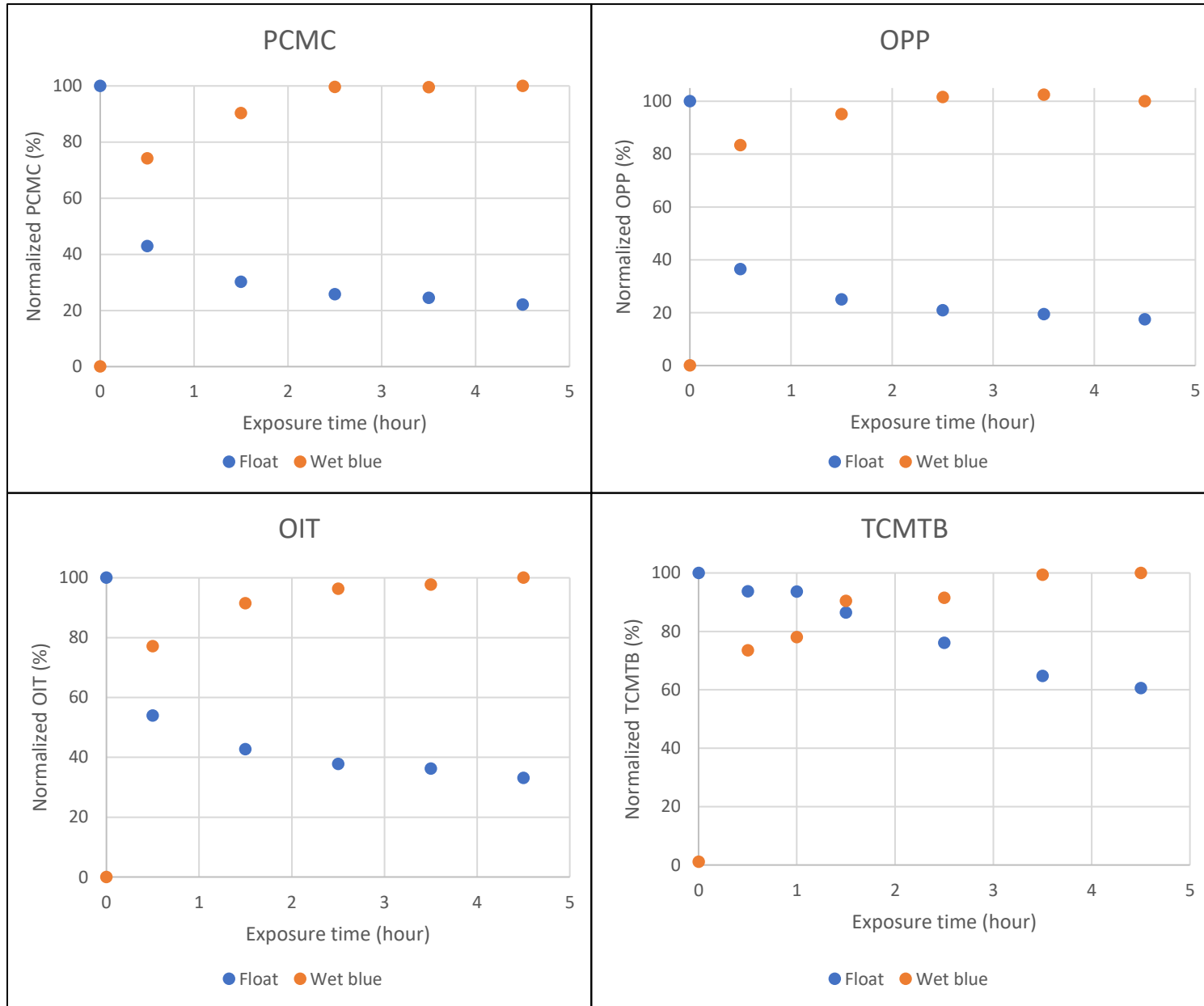
The rate of fungicides uptake



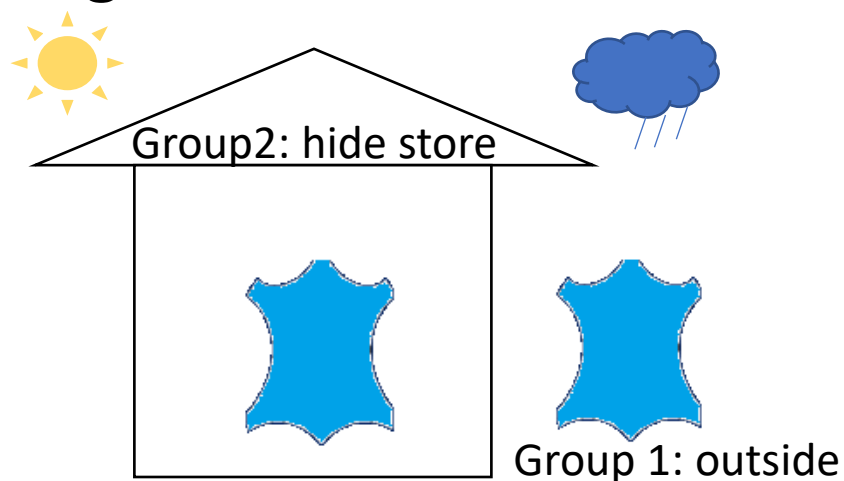
Fungicides remain in the float



Fungicides uptake experiment

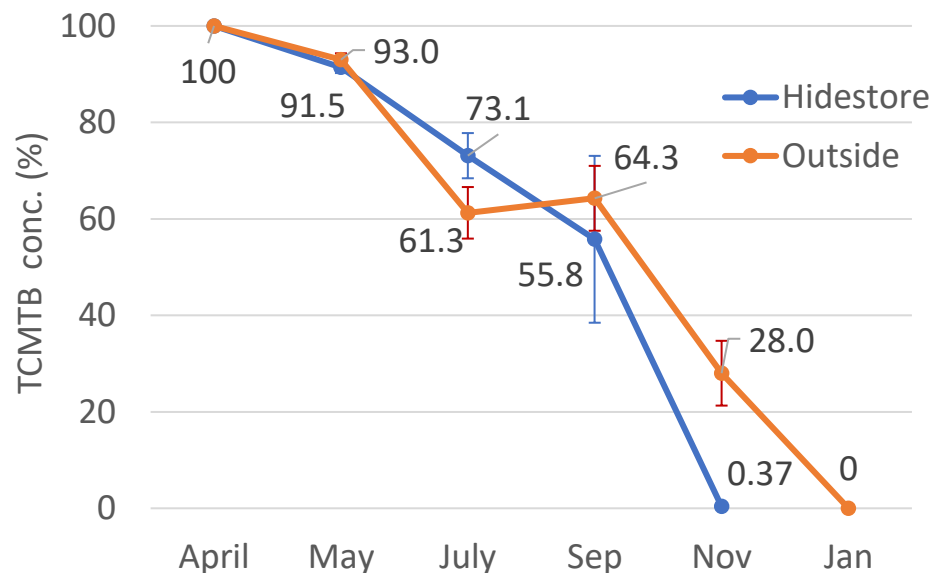


Degradation of TCMTB on wetblue leather during storage

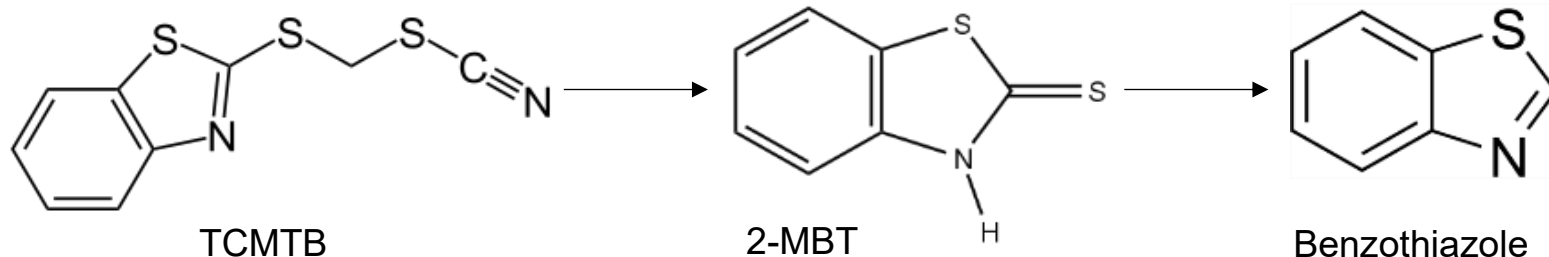


TCMTB on wet blue leather was completely degraded in seven to nine months.
(Note: low initial offer 250ppm wet wt.)

Note: It wasn't until TCMTB fully degraded, that visible fungal infestation was observed.

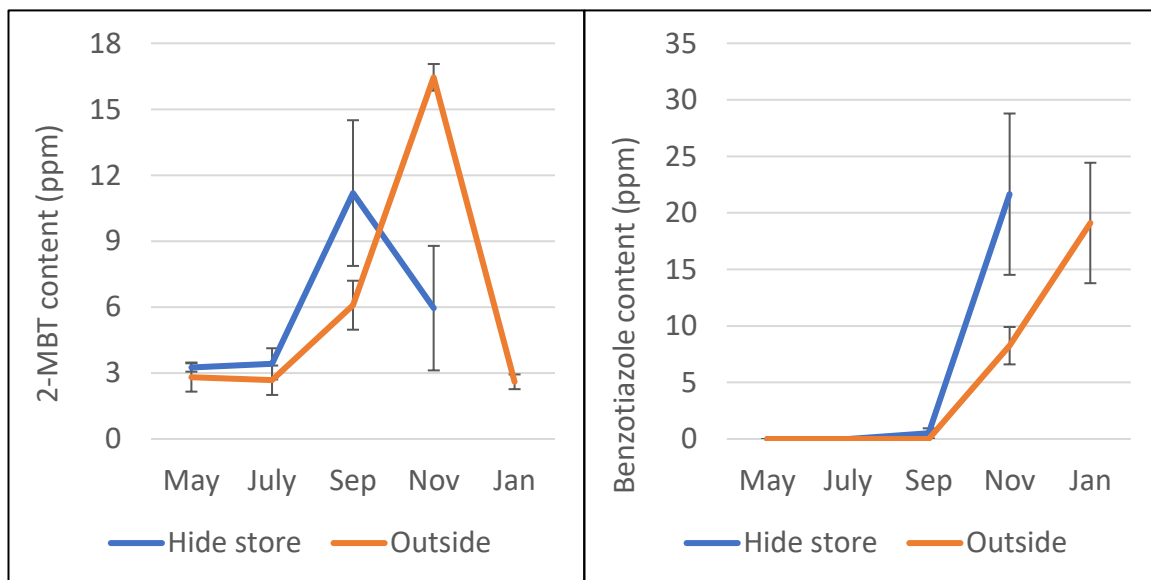


Tracking TCMTB degradation products



An elevation of 2-MBT level was detected at the timepoint before TCMTB fully degraded and then subsequently decline

Benzothiazole was barely detected until TCMTB almost fully degraded.



Conclusion:

1. Partial retention of biocides applied to the cured in later processing could be beneficial for cost saving but also imposes challenge for regulation compliance.
2. Recycling the processing float and carefully modifying the dosage, less biocide will be discarded in wastewater.
3. Temperature has dominant effect on the degradation rate of TCMTB.