



Emissions from wood, treated with copper-amine based wood preservatives - a two years exposure study

**COST ACTION FP1303
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Background

- Generation of realistic leaching rates from preservative-treated wood for environmental risk assessment - BPD (98/8/EC) or BPR (EU No 528/2012) resp.
- Use Class 3 situation: 70 – 80 % of treated timber in EU is used in UC 3 (EWPM, Arona 2005)
- Realistic semi noise barrier test with additional hydrophobic timber treatment
- Leaching behaviour
 - Semi-field test
 - OECD laboratory test (CEN/TS 15119-1)

Impregnation and assembly

- Wood species
 - Scots pine (*Pinus sylvestris*)
- Wood preservatives
 - ACQ 1 (copper, quat, boron)
 - ACQ 2 (copper, quat)
 - ACQ 2 (copper, quat) + hydrophobic finish
 - CCB (reference)
 - untreated control
- Vacuum-pressure treatment

Semi-field test

- Results of 2 years exposure given (08/2009 – 08/2011)
- Leachates collected at HFA test field and analysed
 - at the beginning: after every (major) rain event
 - later: bulked samples
- Chemical Analysis of leachates by ICP-OES
 - Copper
 - Boron



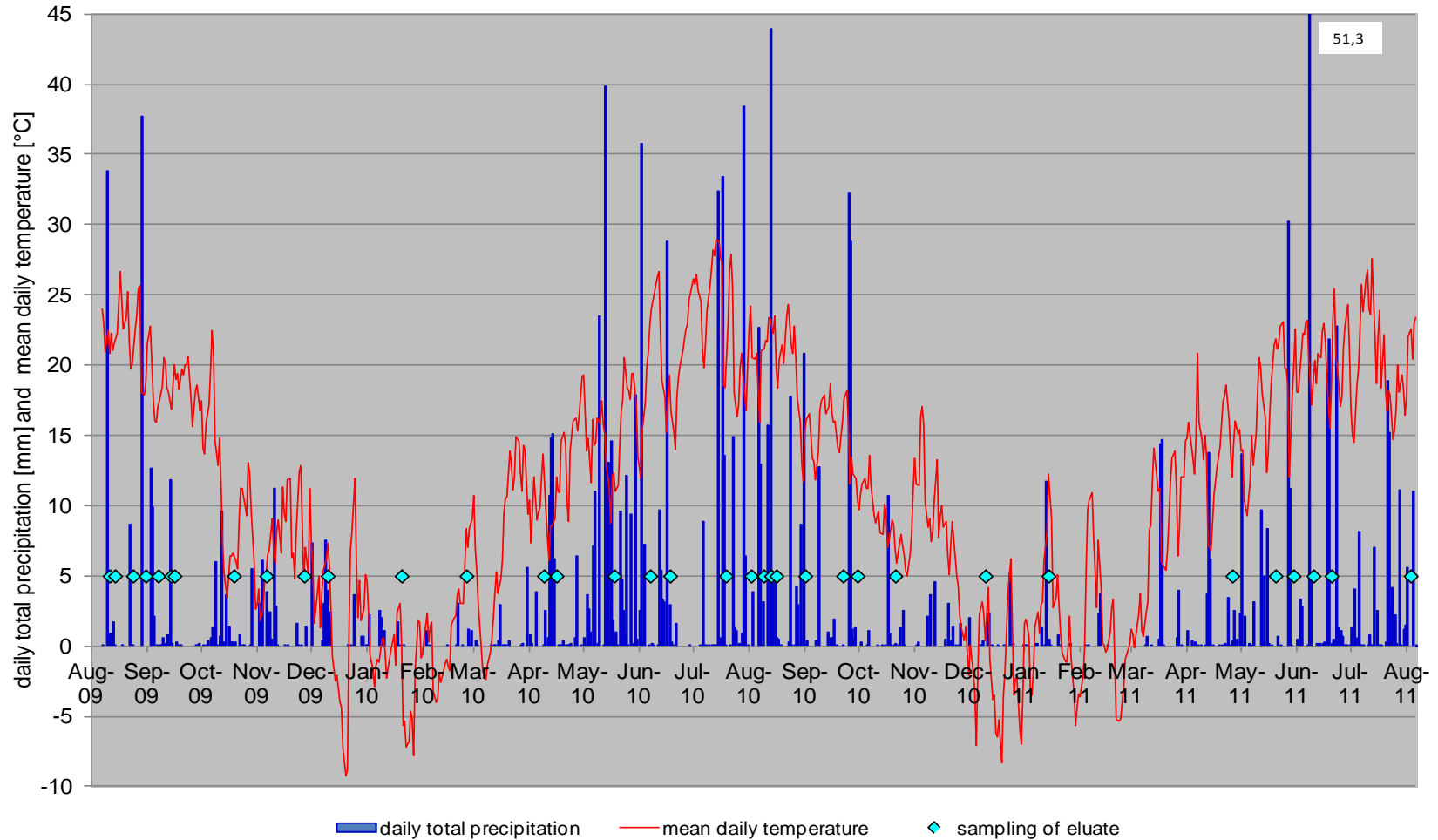
OECD laboratory test

- According to guideline CEN/TS 15119-1:2008
- Scots pine sapwood (*Pinus sylvestris*)
- Sample size: 110 x 40 x 10 mm
- Vacuum treatment
- Leaching procedure:
 - dipping: 3 x 1 min / day
 - 9 dipping days: day 1, 3, 5, 8, 10, 12, 15, 17 and 19
 - ratio of sample surface (m²) to amount of water (m³): 40:1

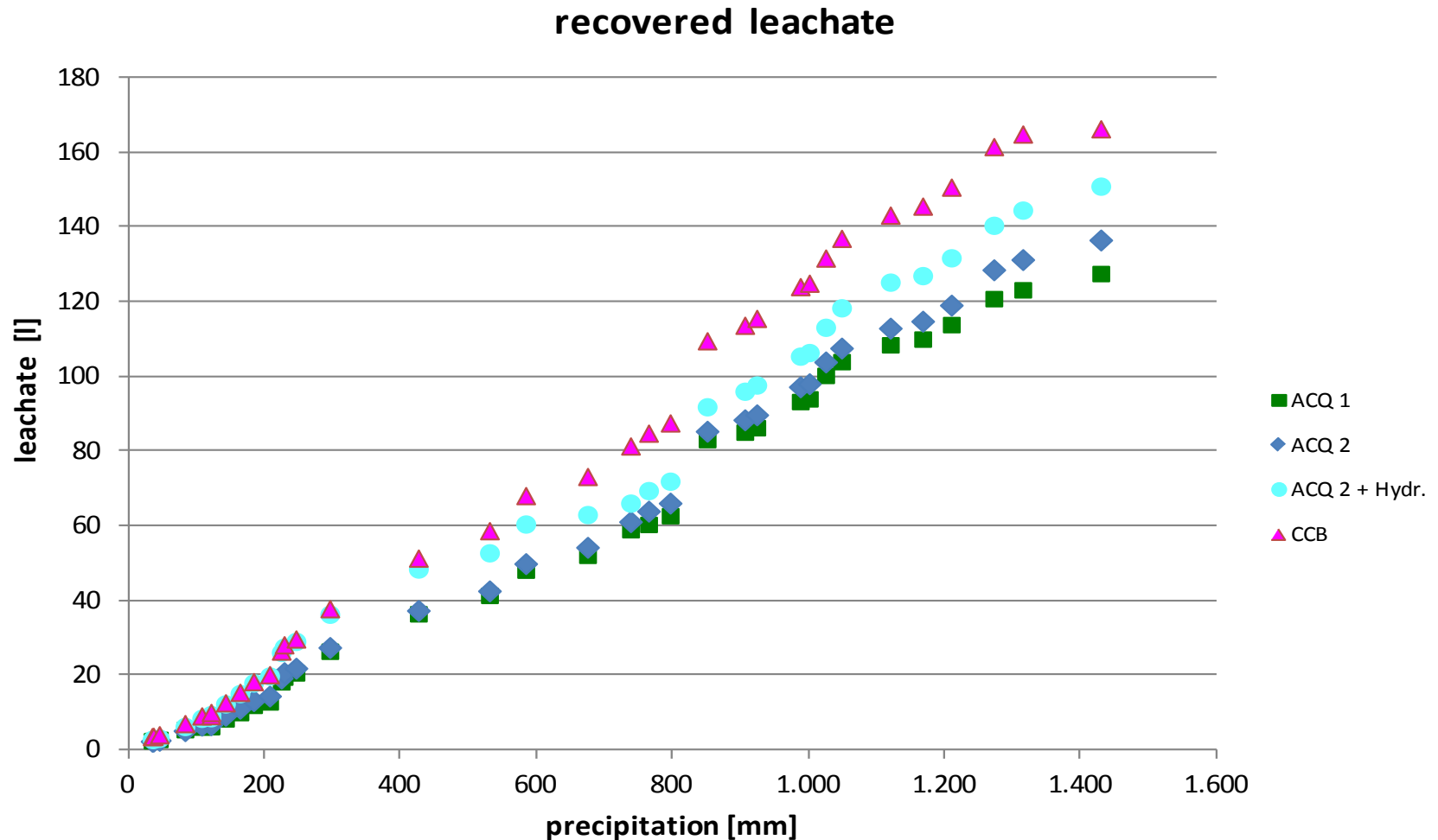


Precipitation and temperature during 2 years of field test

daily total precipitation, mean daily temperature and date of sampling

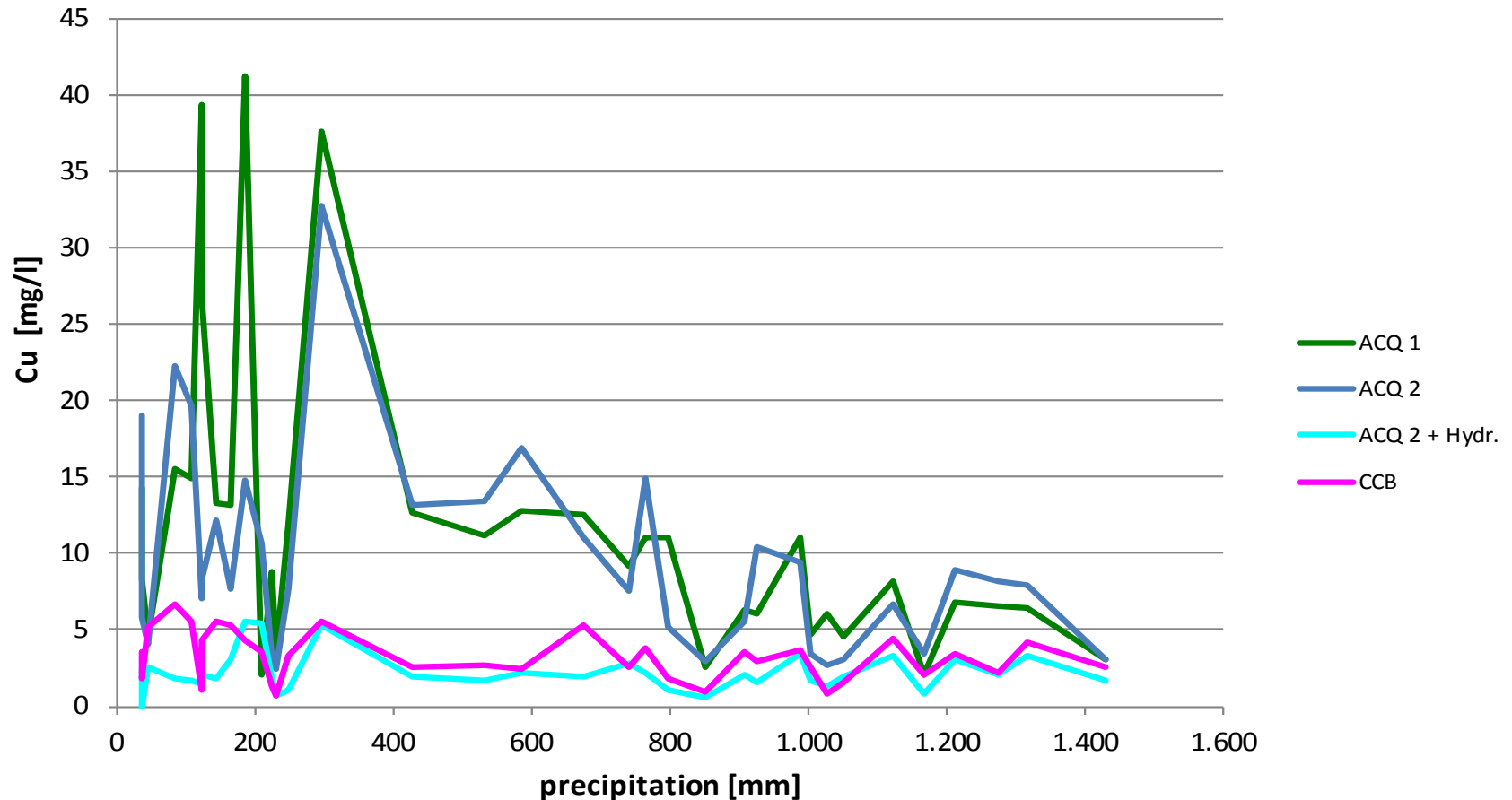


Recovered leachate - accumulated



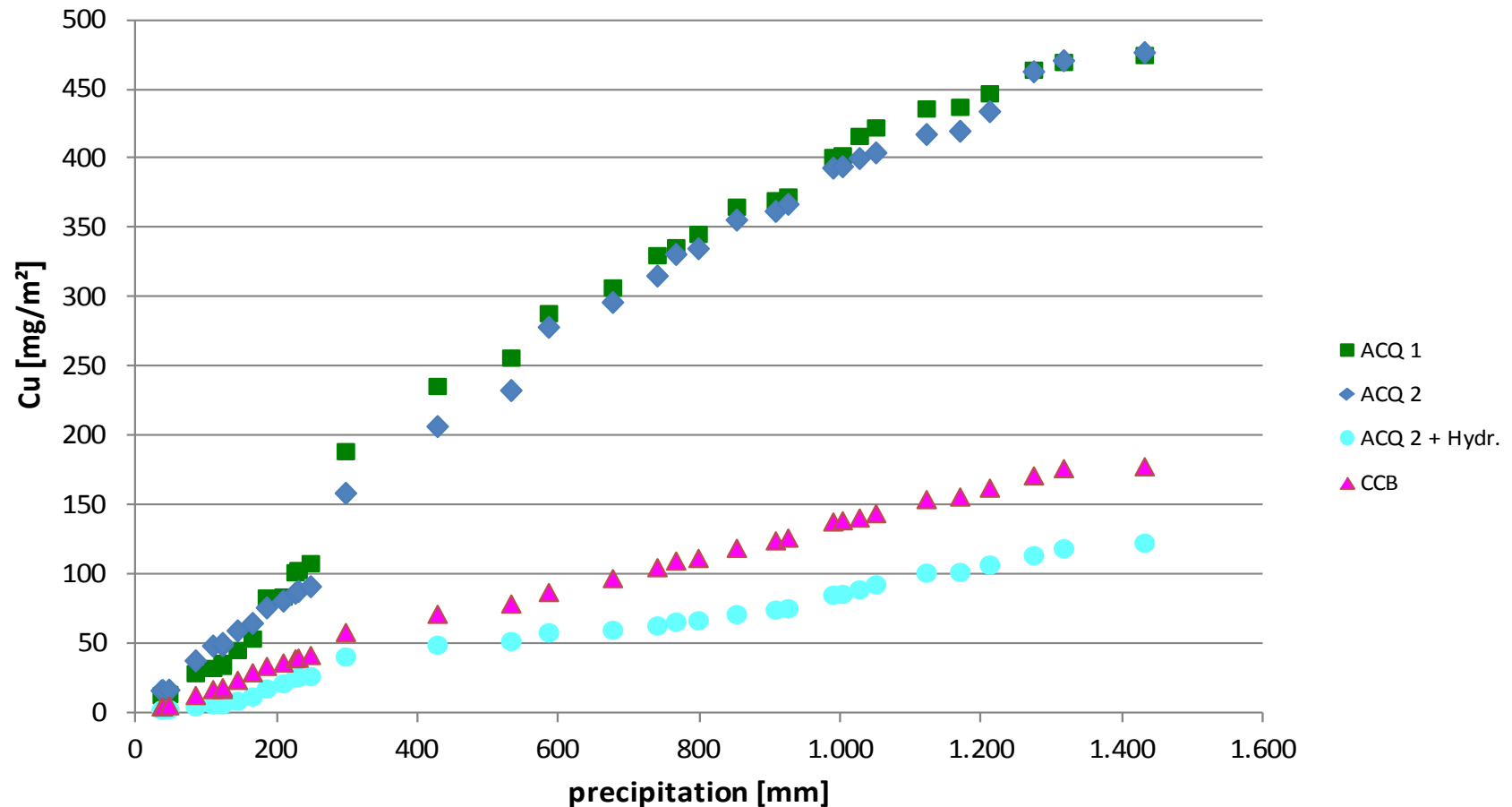
Field test – amount of copper (mg/l) / rain event

Cu leached as a function of accumulated rainfall



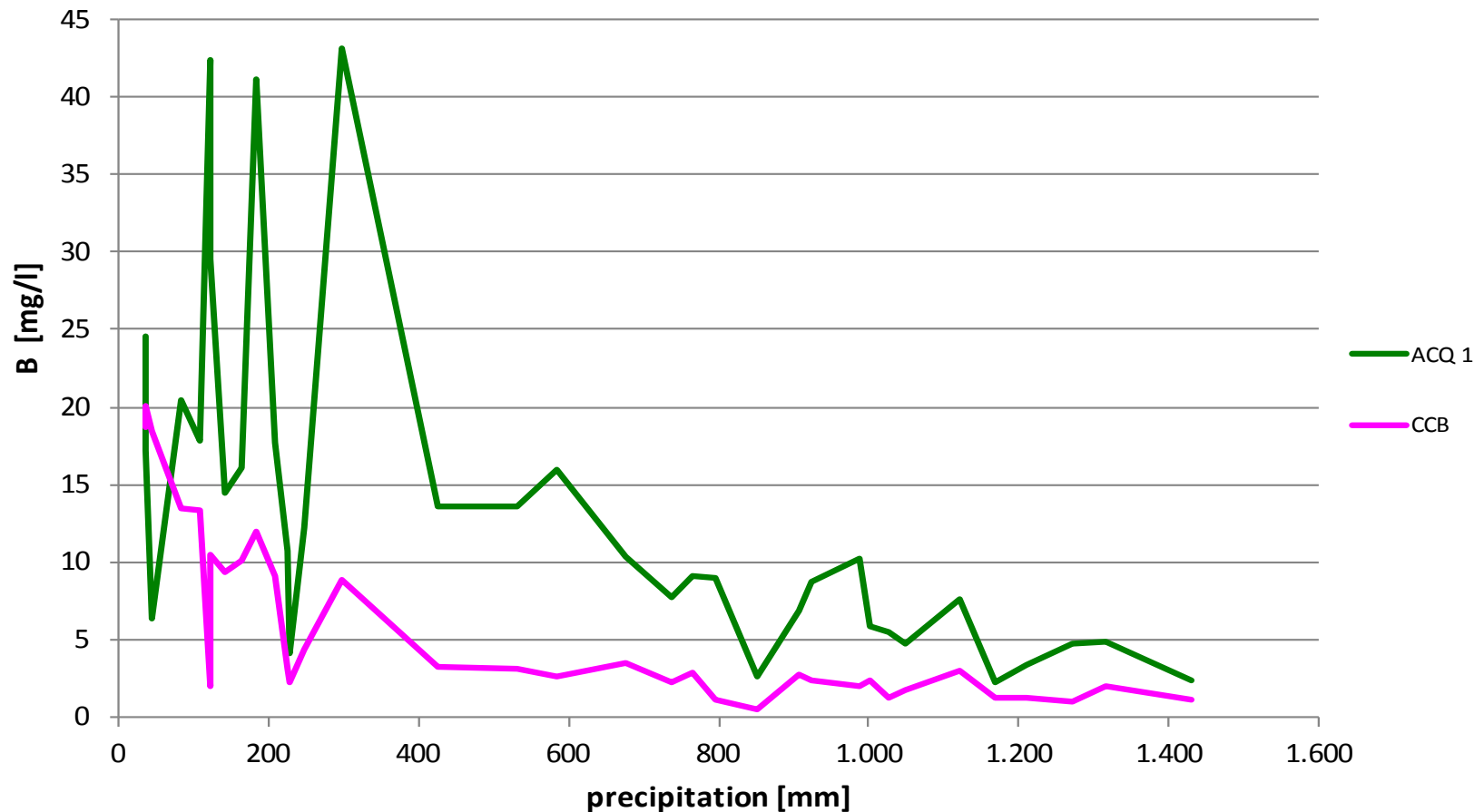
Field test - accumulated copper leaching (mg/m²)

Cu leached as a function of accumulated rainfall



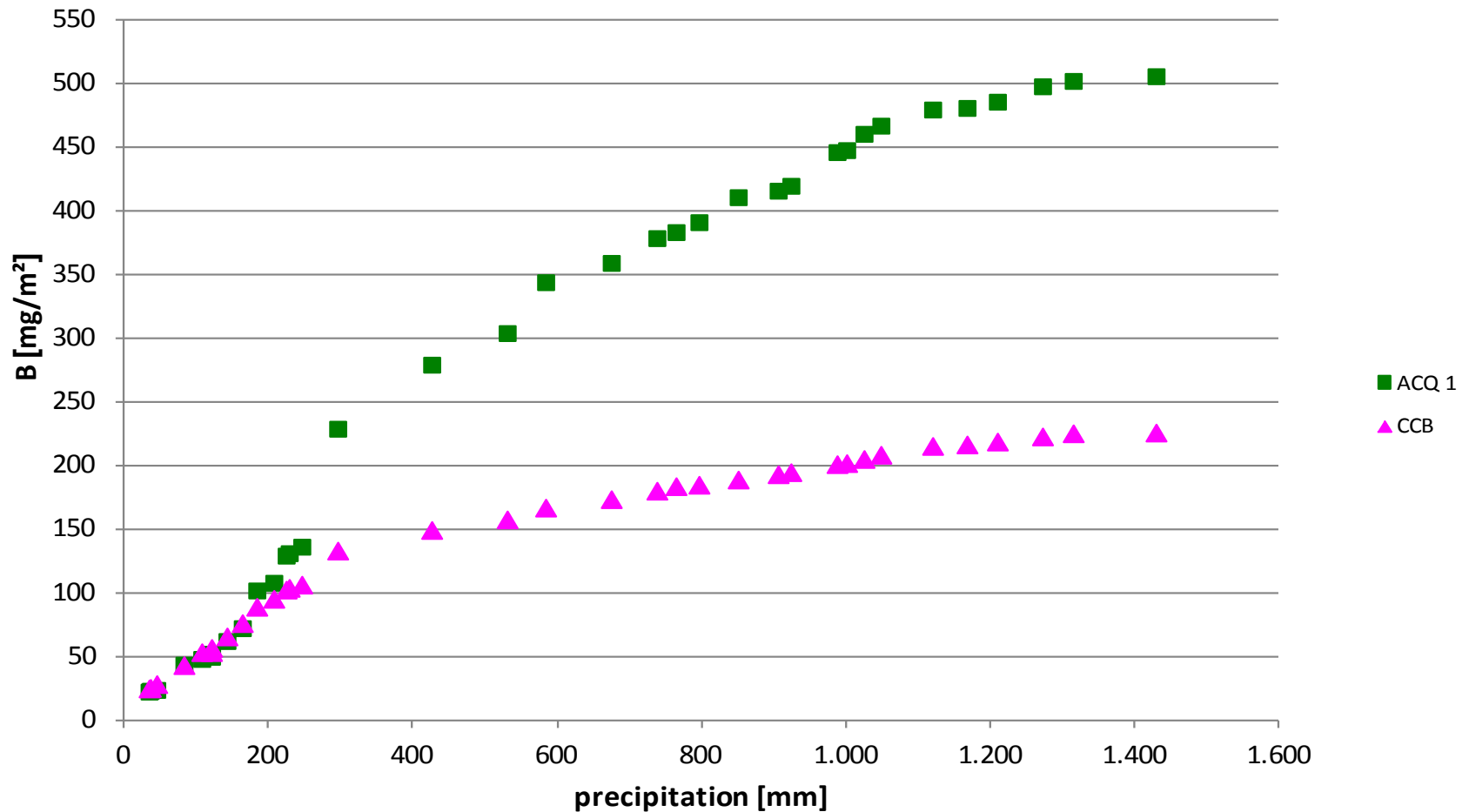
Field test - amount of boron (mg/l) / rain event

B leached as a function of accumulated rainfall



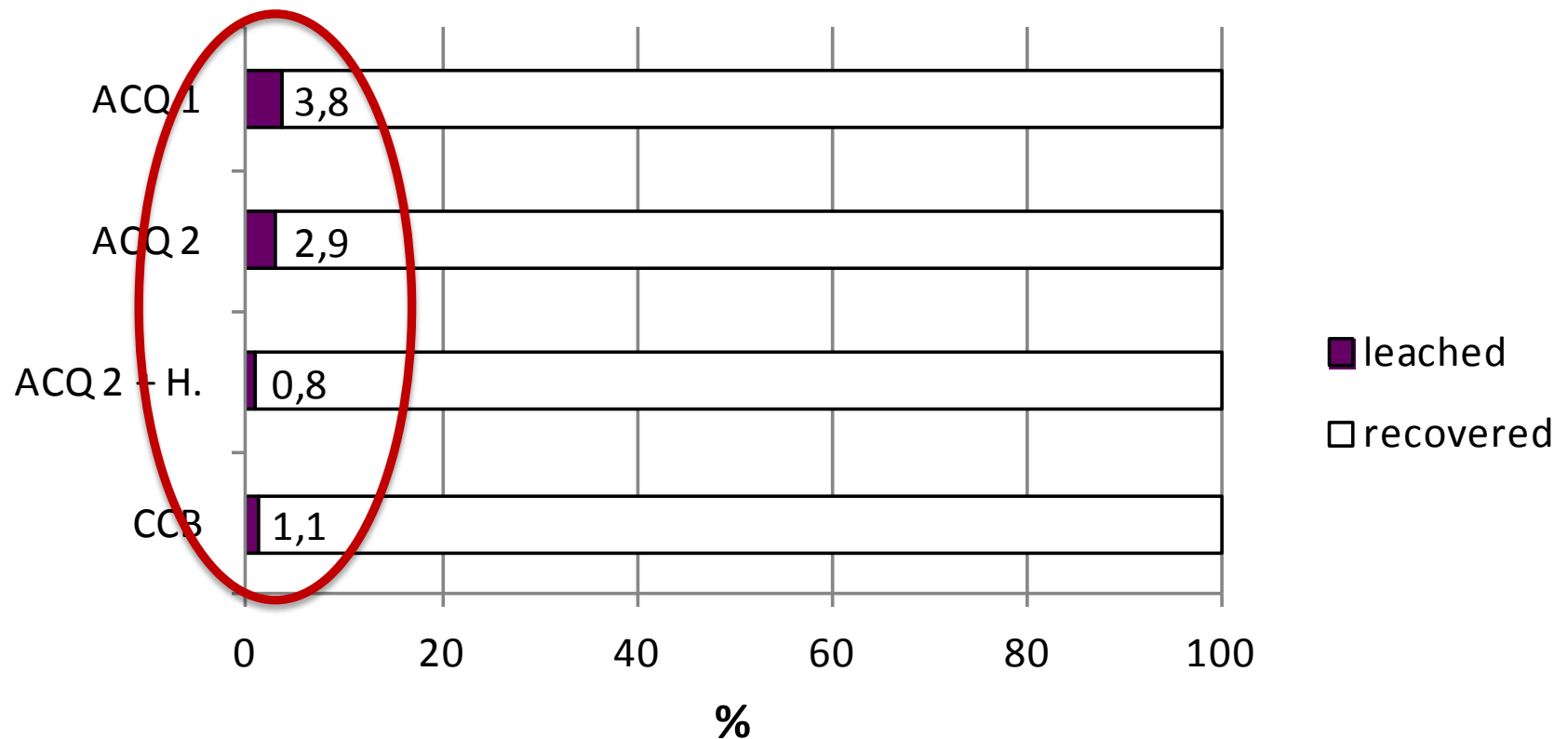
Field test – accumulated boron leaching (mg/m²)

B leached as a function of accumulated rainfall

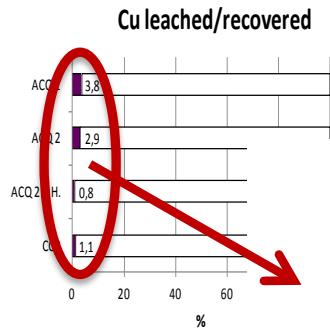


Field test – copper leached (%) in 2 years of outdoor exposure

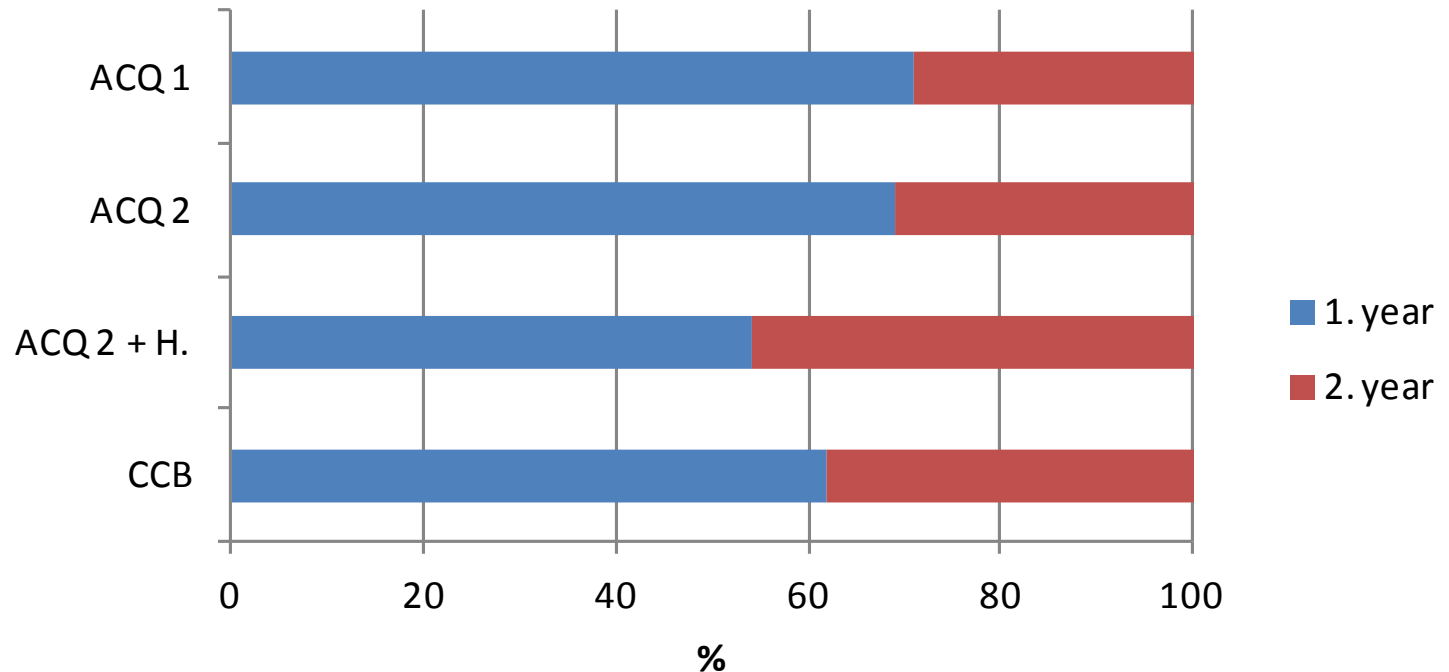
Cu leached/recovered



Field test – copper leached (%) in 1. and 2. year of exposure

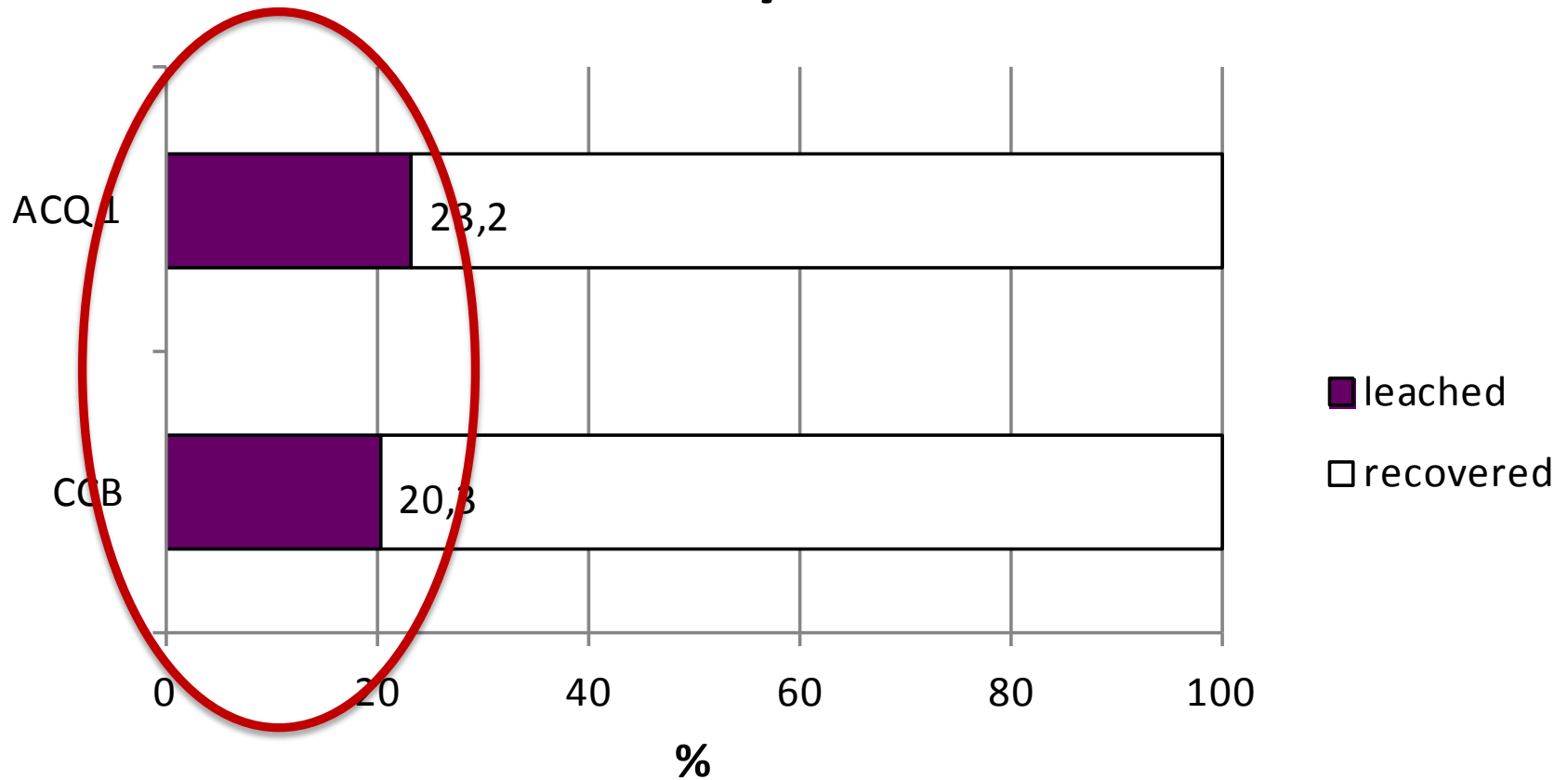


Cu leached in 1. and 2. year

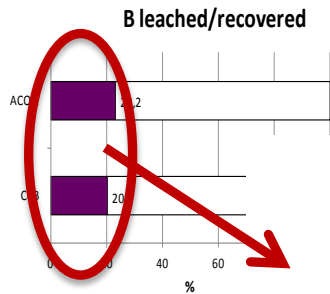


Field test – boron leached (%) in 2 years of outdoor exposure

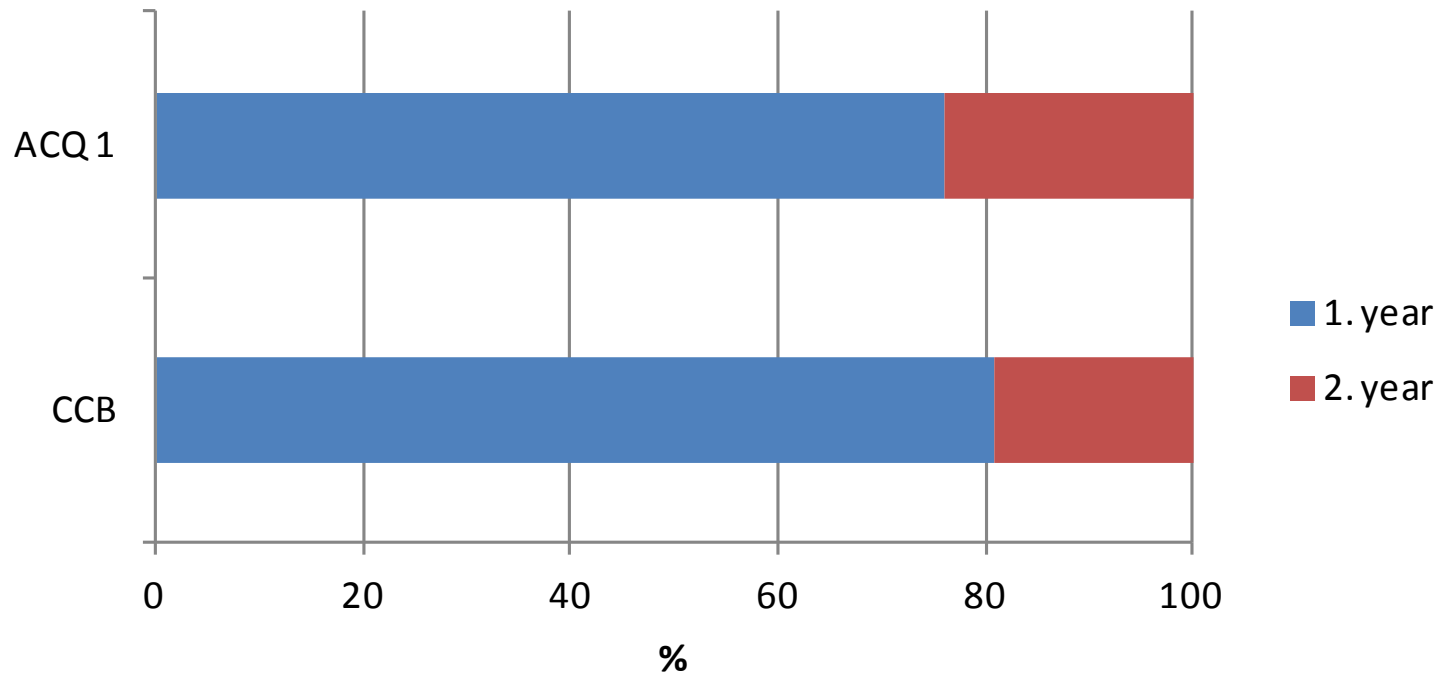
B leached/recovered



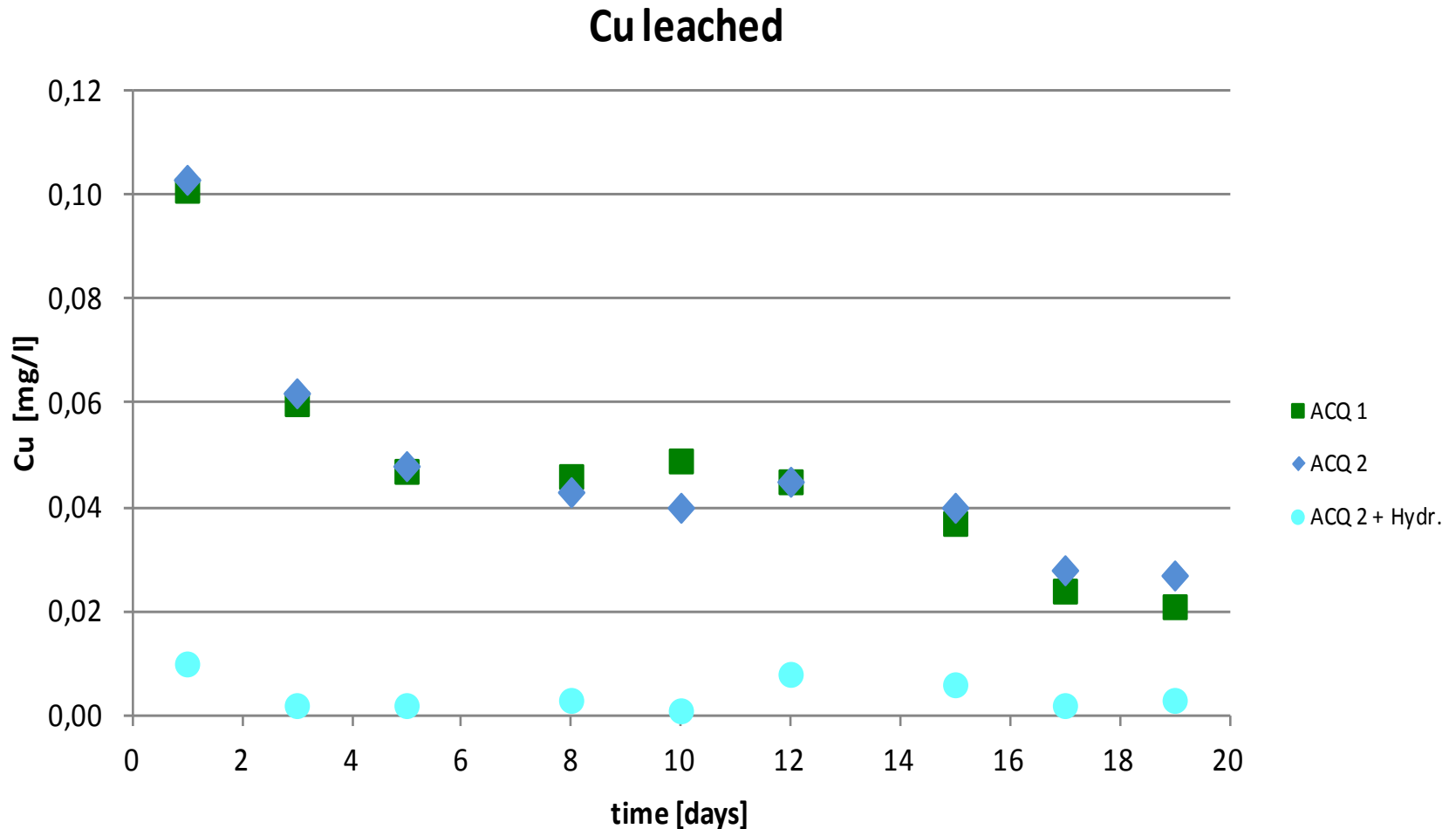
Field test – boron leached (%) in 1. and 2. year of exposure



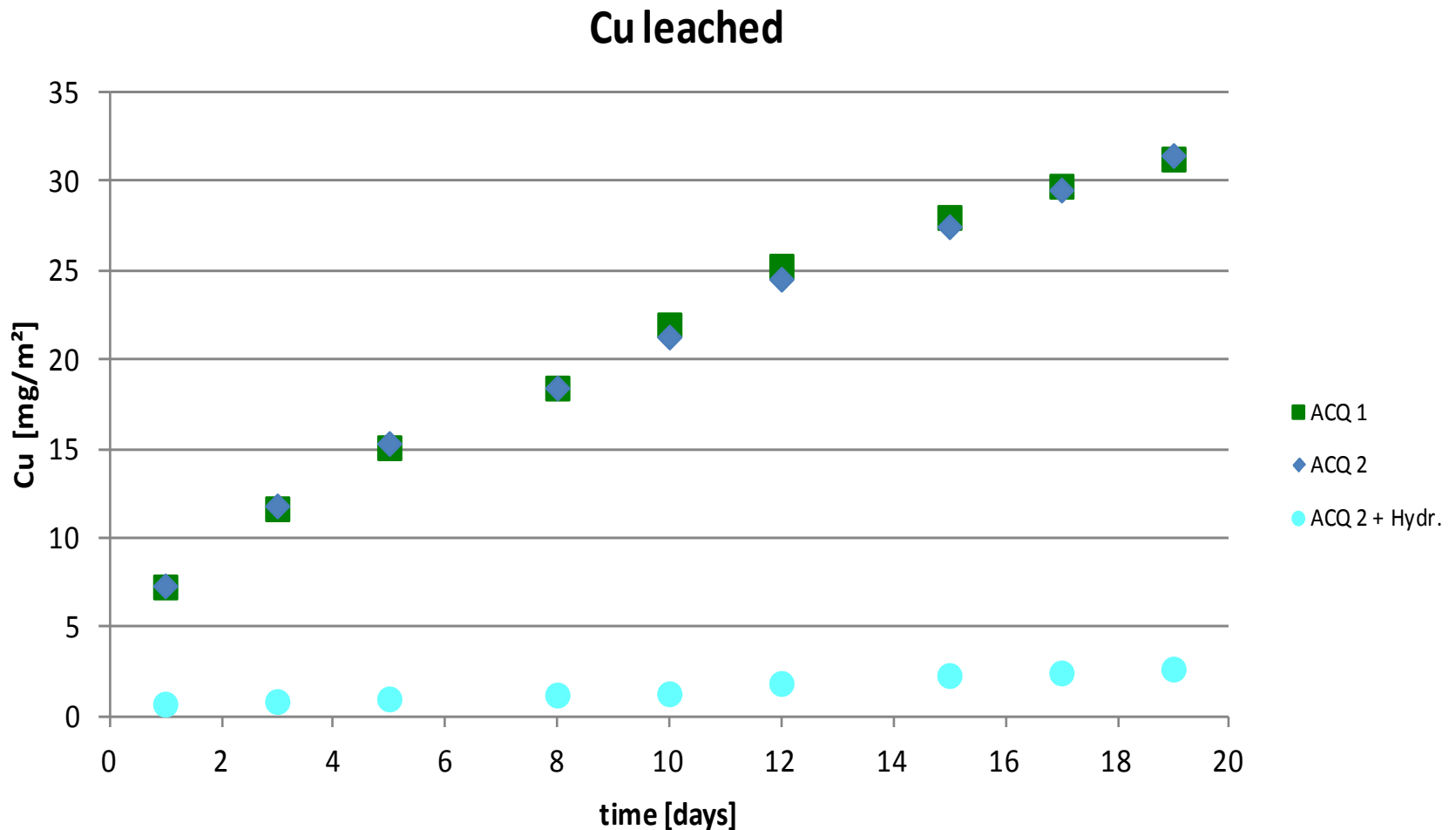
B leached in 1. and 2. year



Laboratory test – copper leached (mg/l) / leaching day

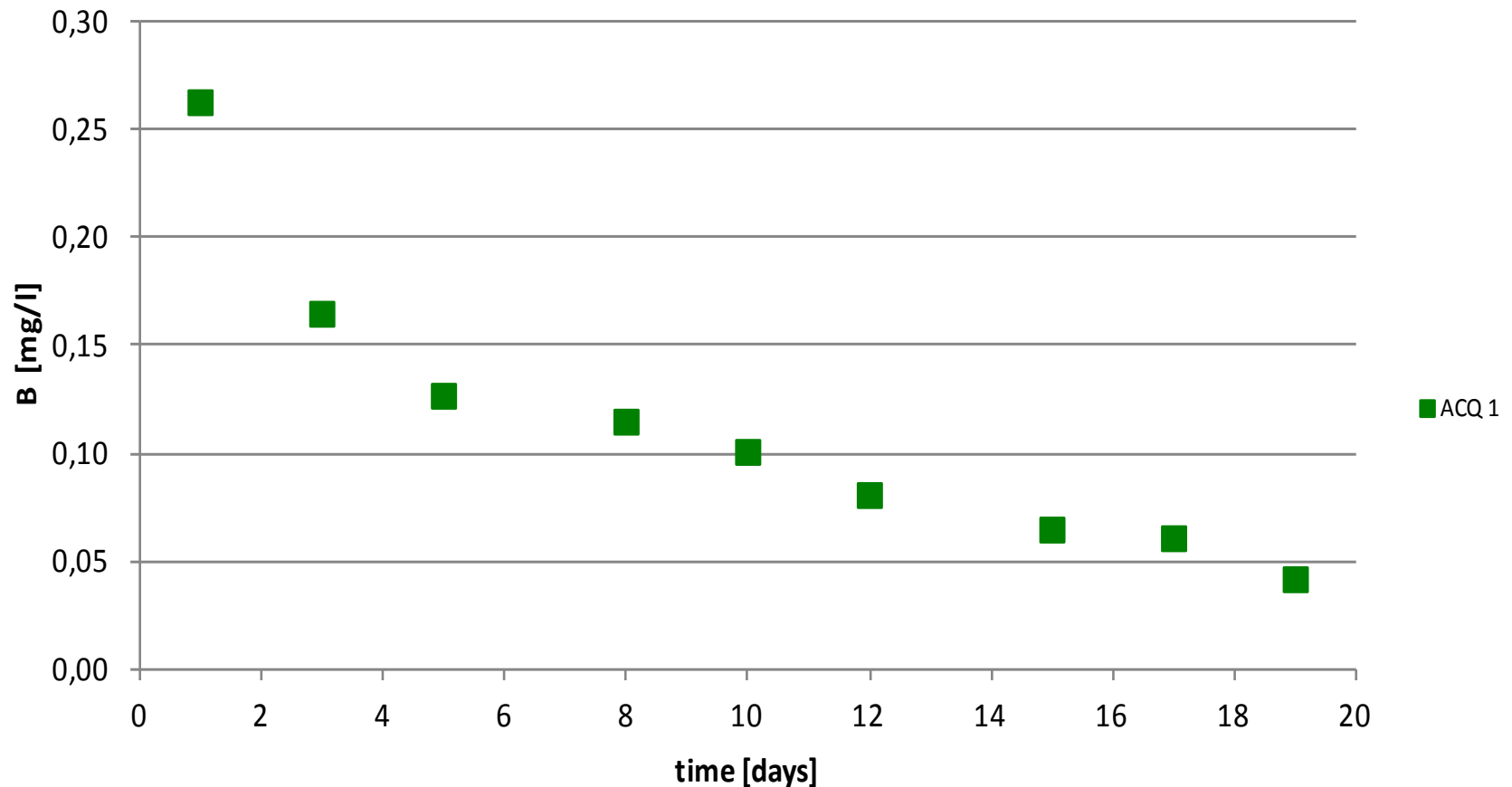


Laboratory test – accumulated copper leaching (mg/m²)

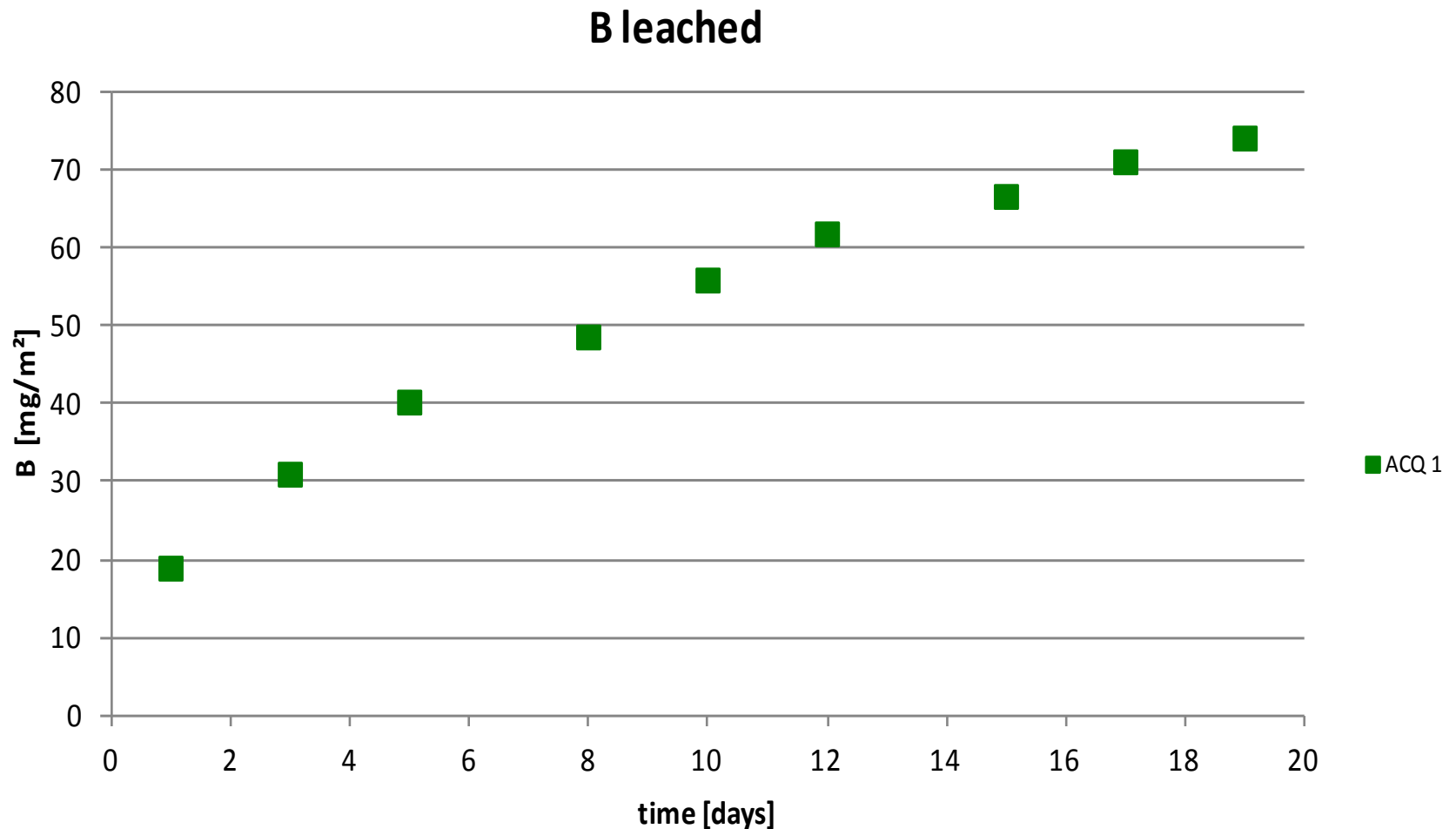


Laboratory test – boron leached (mg/l) / leaching day

B leached

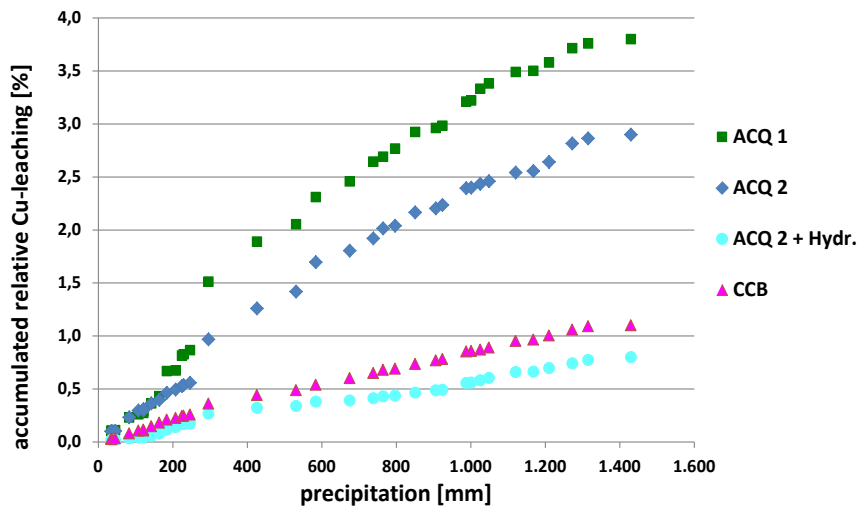


Laboratory – accumulated boron leaching (mg/m²)

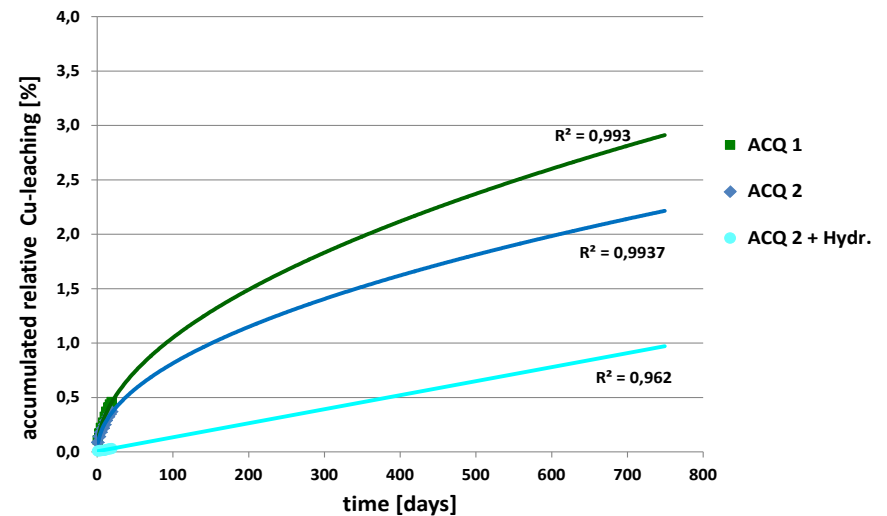


Accumulated copper leaching (%)

Field-test

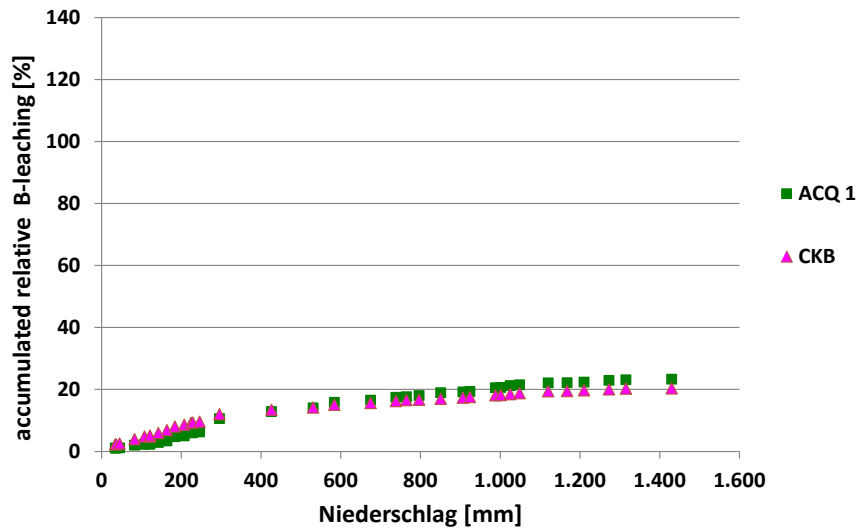


Laboratory-test

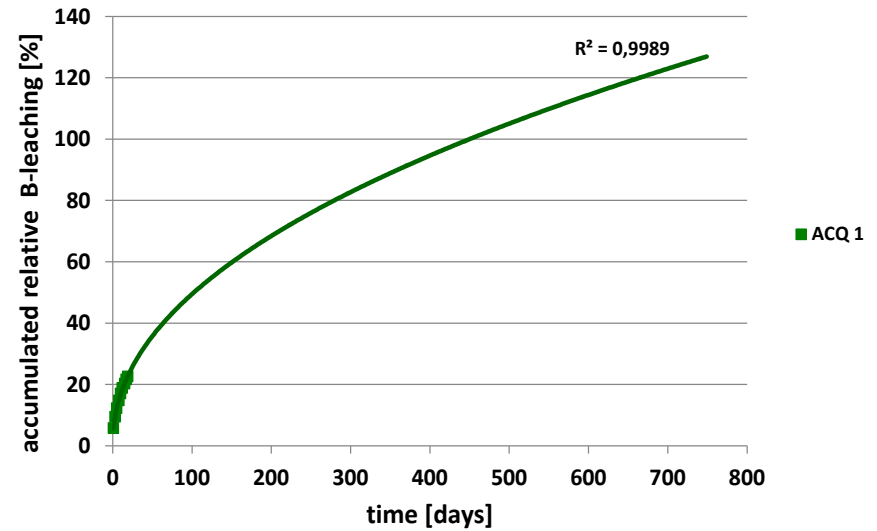


Field-test – accumulated boron leaching (%)

Field-test



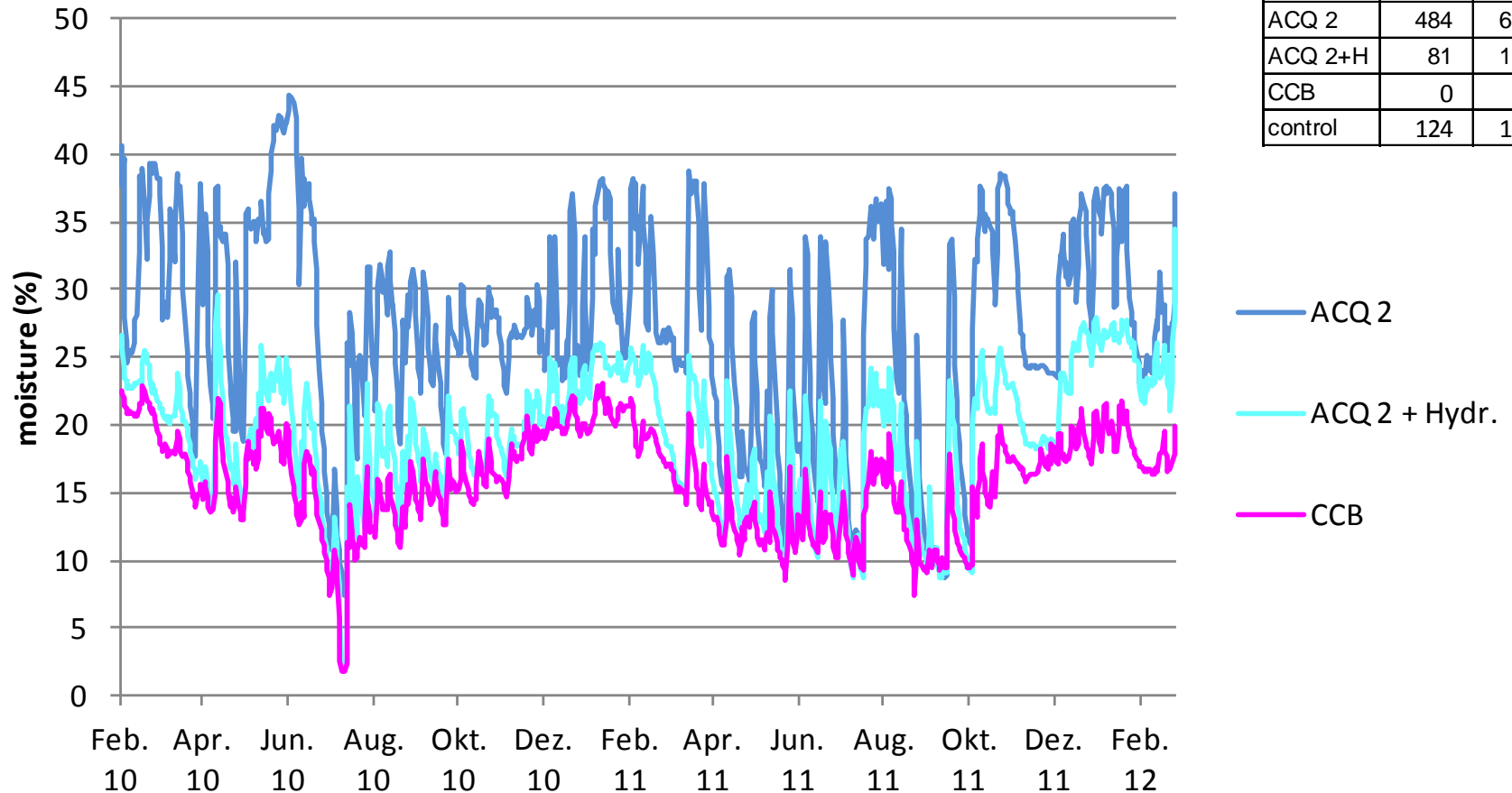
Laboratory-test



Wood moisture in scantlings

ACQ 2 / ACQ 2 + Hydr. / CCB

scantlings



days \geq 25% moisture		
	number	%
ACQ 1	230	30
ACQ 2	484	64
ACQ 2+H	81	11
CCB	0	0
control	124	16

- ACQ 2
- ACQ 2 + Hydr.
- CCB

Summary (1)

Semi-field test (2 years outdoor exposure):

- Chemical analysis of collected leachates revealed a loss of
 - 3,8 % copper and 23,3 % boron in ACQ 1 treated samples
 - 2,9 % copper in ACQ 2 treated samples
 - 0,8 % copper in samples treated with ACQ 2 + hydrophobic finish
 - 1,1% copper and 20,3 % boron in CCB treated samples

Summary (2)

OECD laboratory test (9 days of „rain events“):

- Chemical analyses of leachates revealed a loss of
 - 0,45 % copper and 23 % boron in ACQ 1 treated samples
 - 0,4 % copper in ACQ 2 treated samples
 - < 0,1 % copper in samples treated with ACQ 2 + hydrophobic finish

- Prediction from laboratory test:
 - slightly lower copper-leaching than in semi-field test
 - considerably higher boron-leaching than in semi-field test

Summary (3)

- Study confirms that wood treated with CCB type products show lower wood moisture content compared to untreated wood or wood treated with ACQ

- Positive effect of hydrophobic finish:
 - ~75 % reduction of copper loss within 2 years of outdoor exposure
 - reduced wood moisture content



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