Skurv og pulverskurv i spise og læggekartofler –
Erfaringer fra et tørt forår hvordan vi opnår den bedste skinfinish?

V. *Ole Munk Truelsen, BJ-Agro*

Pulverskurv - *Spongospora subterranea*

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Sammendrag på pulverskurv (og Moptop)

- En svamp i jorden
- Trives ved Rt fra ca 5 til 8 og i kølig jord 9 til 17 gr
- Veldrænet, sund jord.
- Undgå overvanding, men undgå også ustabil vækst
- Mop-topvirus er udbredt i Danmark
- Hvidmelet gåsefod, Sort natskygge og roer naturlig vært for mop-topvirus
- Mop-topvirus spredes med læggeknolde og jord!
- Mop-topvirus forekommer også i knolde uden rust
- Ingen kartoffelsorter er resistente over for mop-topvirus
- Den eneste sikre måde at forhindre smitte af nye marker er ved at dyrke læggekartoflerne i mop-topfri jord hele vejen gennem fremavlssystemet.

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Alm skurv - *streptomyces scabies*

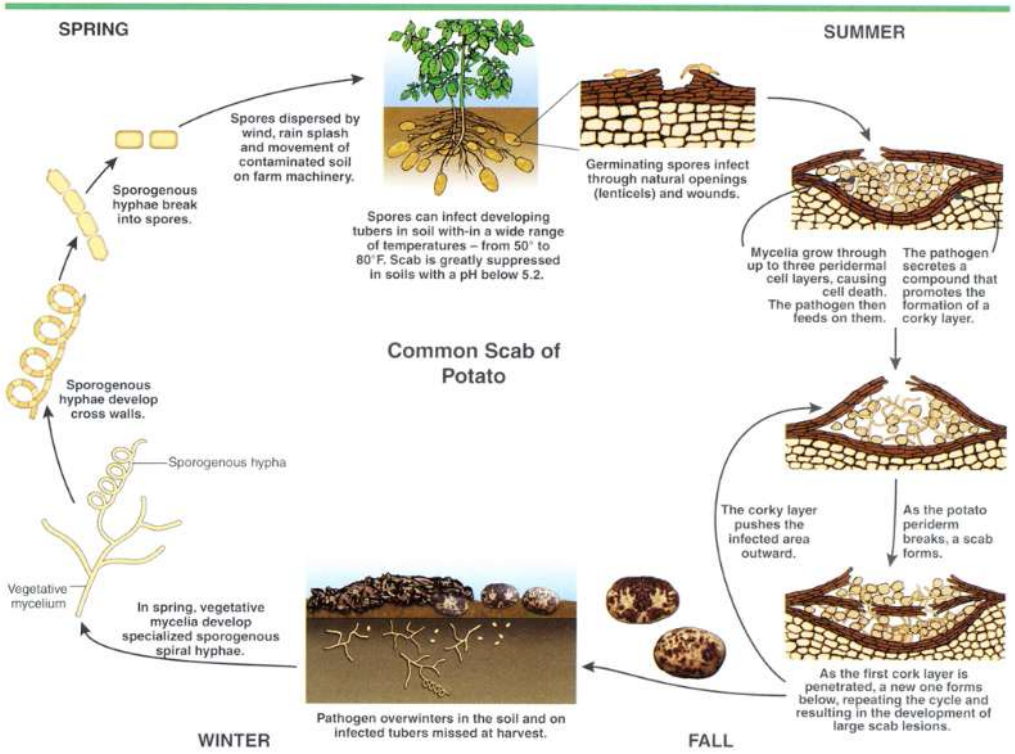
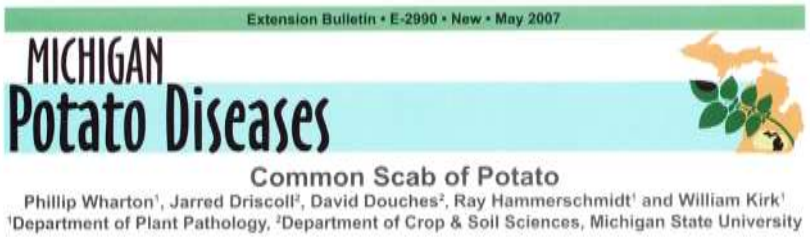


Figure 5. The disease cycle of the common scab pathogen, *Streptomyces scabies*.



- Jordbårn bakterie (flere arter)
- Overfladisk eller stjerneformet symptomer
- Optimum 19-24 gr
- Trives på tørre, lette, iltrige jorde
- Afhænger af jordens pH (+0,5 = Rt)
- Smitter via lenticellerne
- Svovl har en bakterie-hæmmende funktion.
- Mange svovlgødninger er sure og medfører nedsat pH
- Calcium og fosfor overset!
- Mikro-næring, Cu og Zn?
- Hvor længe der skal vandes under tørre forhold? 2-4 (-6) uger efter begyndende knoldsætning

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CONTENTS

Research Review

Ref: 11140047

A Review of Liming, pH and Common Scab Risk in Potatoes

Jennifer Preston, Mark Stalham, Marc Allison & David Firman

NIAB CUF, The Agronomy Centre, 219B Huntingdon Road, Cambridge, CB3 0DL

With editing by

Eric Anderson

Scottish Agronomy Ltd, Arlary Farm, Milnathort, KY13 9SJ

Report No.: 2019/6

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The gypsum data add supportive evidence for a non-pH induced change in scab susceptibility. Despite having a neutral or slight acidifying effect on soil pH, reductions in scab were observed by adding gypsum that could not be explained by the Ca factor since other Ca products had no effect on scab. Gypsum is a well-renowned improvement agent for low organic matter clay soils, causing clay particle flocculation, and this could have increased easily available water-holding capacity in the soil surrounding tubers. Maintenance of soil moisture levels during the period of tuber initiation has provided an effective control measure for scab, gypsum may aid this common scab control method.

- Gips (Calcium) ser ud til at kunne reducere skruv-niveauet
- Men effekten skal nok mest tillægges den jordforbedrende effekt, speciel i jorde med lavt indhold af organisk materiale
- Gips (calcium) kan øge jordens vandholdningsevne

Research Review

Ref: 11140047

A Review of Liming, pH and Common Scab Risk in Potatoes

Jennifer Preston, Mark Sullam, Max Allison & David Firman

With editing by

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Report No.: 2015/6

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Research Review
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A Review of Liming, pH and Common Scab Risk in Potatoes

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Report No.: 2019/6

Table **4** shows results from a trial conducted in 1989/90 by Lambert & Manzer (1991), with incidence of scab being unaffected by gypsum, but increased by the application of lime.

Table 4. Percentages of tubers in each scab severity class from soil treated with gypsum or lime

	Inoculated and harvested			Inoculated 1989 and harvested 1990			Inoculated 1989, 1990 and harvested 1990		
	Percentage of tuber surface affected								
Treatment†	0%	1-10%	> 10%	0%	1-20%	>20%	0%	1-20%	>20%
Control	80 b‡	19 a	2 a	100 b	0 a	0 a	78 b	16 a	6 a
Gypsum	82 b	16 a	2 a	100 b	0 a	0 a	78 b	17 a	6 a
Lime	47 a	41 b	12 b	68 a	18 b	14 b	20 a	35 b	45 b

Gips

Kalk

†Plots were inoculated in 1989 with or without re-inoculation in 1990.

‡Means within columns followed by the same letter do not differ significantly (P≤0.05).

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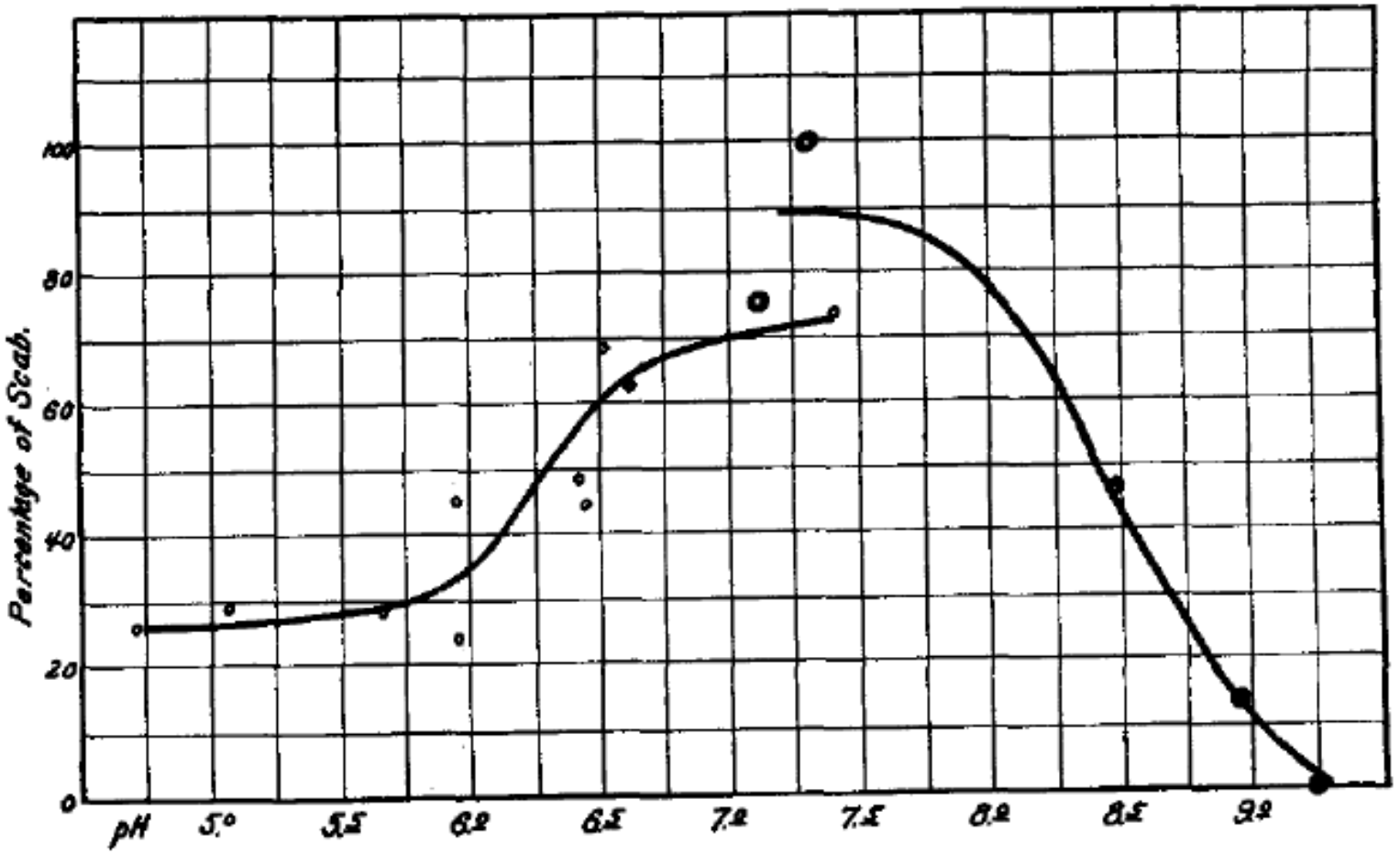
Figure 1. Curves showing the relation of average pH to percentage of scabby tubers for the results of experiments. Curve from pH 4.7 to 7.4 on LHS. Curve pH 7.2 to 9.3 on RHS. Source: Blodgett & Cowan (1935).



Rt	5,5	6,0	6,5	7,0	7,5	8,0	8,5	9,0	9,5

Research Review

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A Review of Liming, pH and Common Scab Risk in Potatoes

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TABLE 1. Effect of 1971 fertilizer and chemical treatments on common scab severity of potato and Ca/PO_4-P ratios in tuber peelings

Treatment	Scab incidence[r]				
		% of tubers with scab coverage of:[s]			
	Scab[q] index	Scab-free	With > 3% scab coverage	With > 5% scab coverage	Ca/PO_4-P[r] ratios
$Ca(NO_3)_2$[t]	4.6 a	23 ab	16 a	7.5 a	0.65 a
$(NH_4)_2SO_4$	3.9 ab	31 ab	11 abc	4.3 abc	0.39 b
$Ca(NO_3)_2$ + S[u]	3.4 bc	38 bc	7 abcd	2.9 abcd	0.58 a
$(NH_4)_2SO_4$ + S[v]	2.5 cd	53 cde	2 de	0.4 d	0.33 b
$(NH_4)_2SO_4$ + N-Serve[w]	4.7 a	18 a	16 a	6.9 a	0.37 b
$Ca(NO_3)_2$ + N-Serve[w]	3.8 ab	28 ab	9 abcd	2.9 abcd	0.59 a
$(NH_4)_2SO_4$ + S[v] + N-Serve[w]	3.1 bcd	42 bcd	5 bcde	1.1 bcd	0.28 b
$Ca(NO_3)_2$ + S[u] + N-Serve[w]	2.5 cd	55 cde	3 cde	0.6 cd	0.34 b
$(NH_4)_2SO_4$ + N-Serve[x]	4.7 a	16 a	13 ab	7.0 a	
$(NH_4)_2SO_4$ + N-Serve[y]	3.7 ab	26 ab	7 abcd	1.0 bcd	
$(NH_4)_2SO_4$ + PCNB[z]	2.0 d	70 e	1 e	0.6 cd	
$(NH_4)_2SO_4$ + PCNB + N-Serve[w]	2.4 cd	60 de	3 de	0.5 cd	

[q]Higher values denote higher scab.

[r]Level of significance for Duncan's multiple range test. Treatment means not followed by the same letters are significantly different, P = 0.05.

[s]Determined as percentage by weight.

[t]All nitrogen treatments applied at 200 kg N/ha with triple-superphosphate at 168 kg P_2O_5/ha.

[u]Sulfur applied at 897 kg/ha with $Ca(NO_3)_2$.

[v]Sulfur applied at 673 kg/ha with $(NH_4)_2SO_4$.

[w]N-Serve [2-chloro-6-(trichloromethyl)-pyridine] applied at 1.7 kg/ha.

[x]N-Serve applied at 0.6 kg/ha.

[y]N-Serve applied at 1.1 kg/ha.

[z]Broadcast application of PCNB (pentachloronitrobenzene) at 28 kg/ha.

TABLE 3. Effect of 1973 phosphate fertilizer treatments on common scab severity of potato and Ca/PO_4-P ratios in tuber peelings

Treatment	Scab incidence (% of tubers with scab coverage of:)[s,t] With > 5% scab coverage	With > 10% scab coverage	Ca/PO_4-P ratios[s]
NH_4NO_3[u] + S[v]	74 c	49 c	4.0 c
NH_4NO_3 + S[w] + P_2O_5[x]	52 ab	26 ab	3.2 ab
NH_4NO_3 + S[y] + P_2O_5[x]	47 a	21 a	2.6 a
NH_4NO_3 + S[y] + P_2O_5[x] + KCl[z]	62 bc	38 bc	3.4 bc
NH_4NO_3 + P_2O_5[x]	45 a	23 a	3.2 ab
$(NH_4)_2SO_4$ + S[v]	69 c	45 c	
$(NH_4)_2SO_4$ + S[w] + P_2O_5[x]	46 a	26 a	
$(NH_4)_2SO_4$ + P_2O_5[x]	46 a	23 a	

[s]Level of significance for Duncan's multiple range test. Treatment means not followed by the same letters are significantly different. $P = 0.05$.

[t]Determined as percentage by weight.

[u]All nitrogen treatments applied at 200 kg N/ha.

[v]Flowers of sulfur applied at 67 kg/ha.

[w]Sulfur coating on triple-superphosphate equivalent to 67 kg/ha.

[x]Triple-superphosphate applied at 168 kg/ha P_2O_5.

[y]Sulfur applied at 291 kg/ha - 67 kg/ha with sulfur coating on triple-superphosphate + 224 kg S/ha as flowers of sulfur.

[z]168 kg/ha K_2O.

Since triple-superphosphate showed no inhibition of *S. scabies* in petri-plate culture, the effect of triple-superphosphate on scab severity appears to be indirect.

Trippelsuperfosfat inhiberer ”skurv” i petriskåle → indirekte effekt

Selv ved høje fosfor-indhold i jorden – gav tilførsel af TSP mindre skurv

Although residual phosphorus levels in soil were high (> 20 μg P/g of soil in the upper 23 cm of soil profile), phosphate treatments showed striking effects. Triple-superphosphate treatments reduced scab severity and significantly increased total yield (9-17%) and yield of U. S. No. 1 potatoes (83-104%).

Manganese relationship.—Manganese chelate showed a slight but significant reduction of scab index from 9.4 to 8.3 when ammonium nitrate was used, but not when ammonium sulfate was used. No significant effect was observed on percentage of U. S. No. 1 tubers. Manganese levels in petioles from untreated plants and from plants treated with manganese were respectively 54 and 72 μg/g of dry tissue.

Mangan kan reducere skurv-index men kun hvor der er brugt Ammonium-Nitrat men ikke når der er brugt Ammonium-Sulfat

Fertilizer Effects on Common Scab of Potato and the Relation of Calcium and Phosphate-Phosphorus

J. R. Davis, R. E. McDole, and R. H. Callihan

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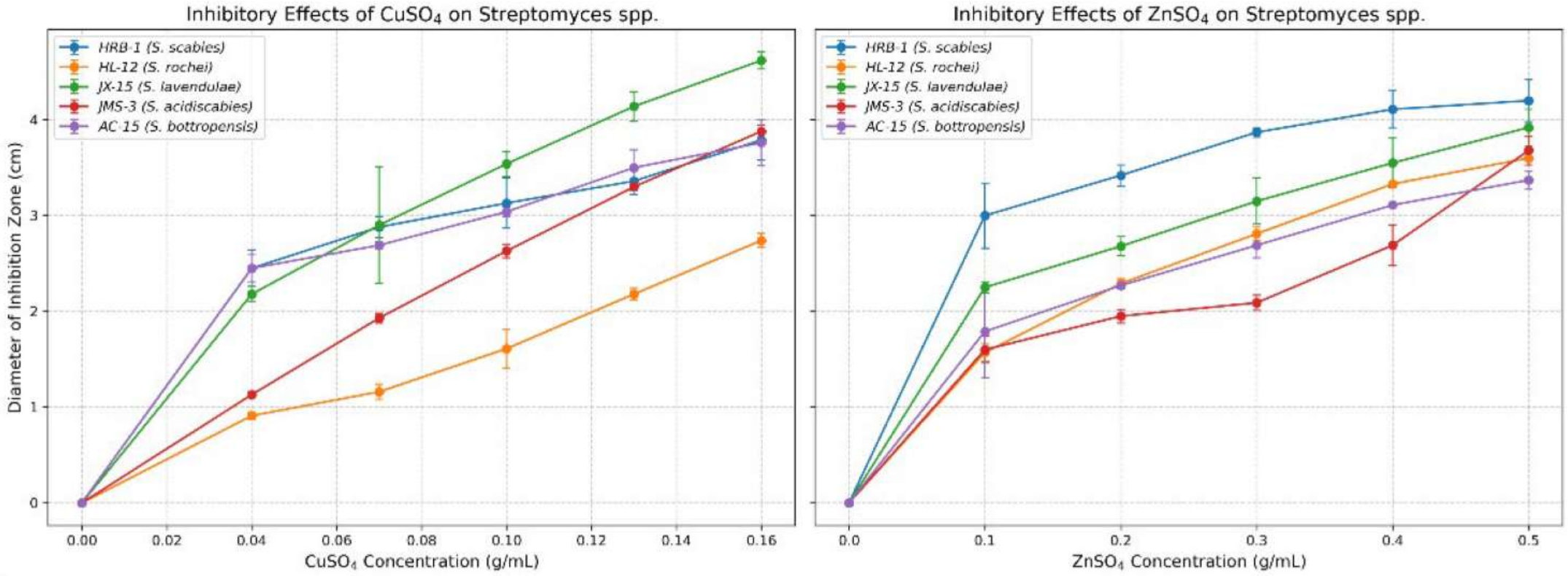
Article

Copper and Zinc Sulfates Suppress *Streptomyces* spp. and Enhance Potato Resistance via Thaxtomin A Inhibition and Defense Gene Regulation

Nianzhou Chen, Shuning Zhou, Shuo Yan, Xin Yuan, Weiqi Jiao, Xinbo Wang, Jie Liu and Xuanzhe Zhang *

Department of Plant Pathology, College of Plant Protection, Northeast Agricultural University, Harbin 150038, China; c841170003@gmail.com (N.C.); zhousn2001@163.com (S.Z.); shuoyan666777888@163.com (S.Y.); yxin7996@gmail.com (X.Y.); qaqjwq@163.com (W.J.); 18800469101@163.com (X.W.); 2724607170@gmail.com (J.L.)
* Correspondence: zhe385@163.com; Tel.: +86-15104516672



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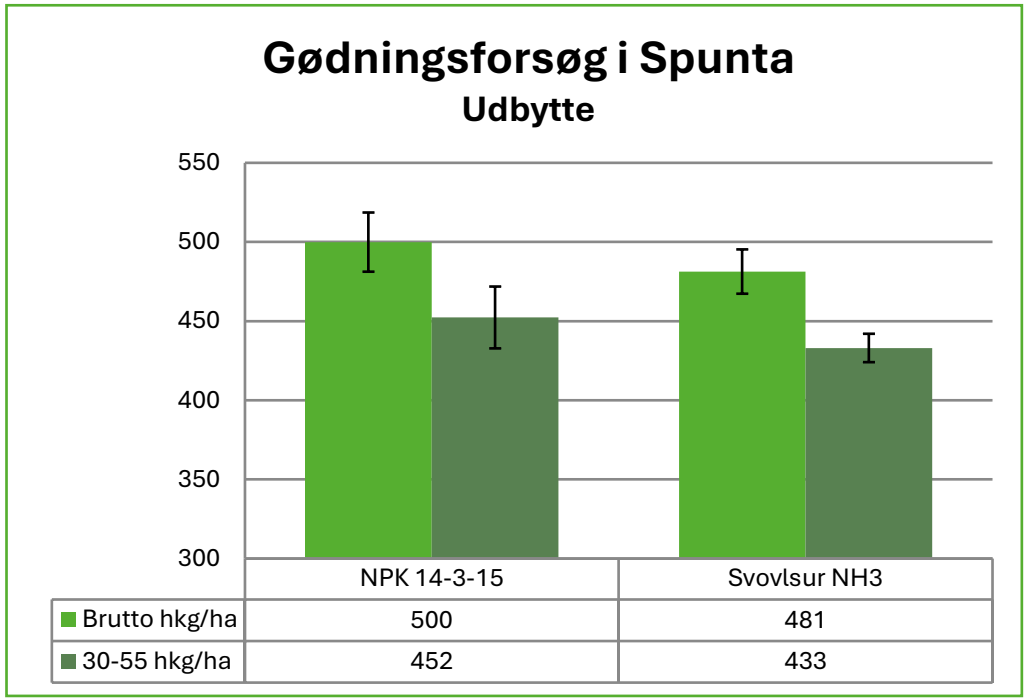
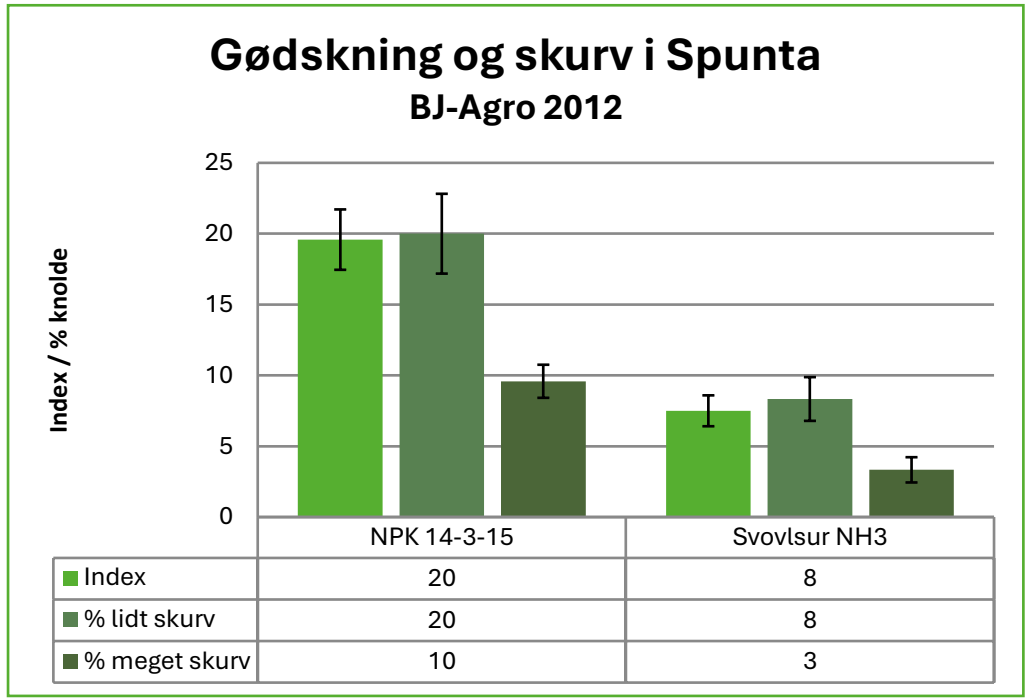
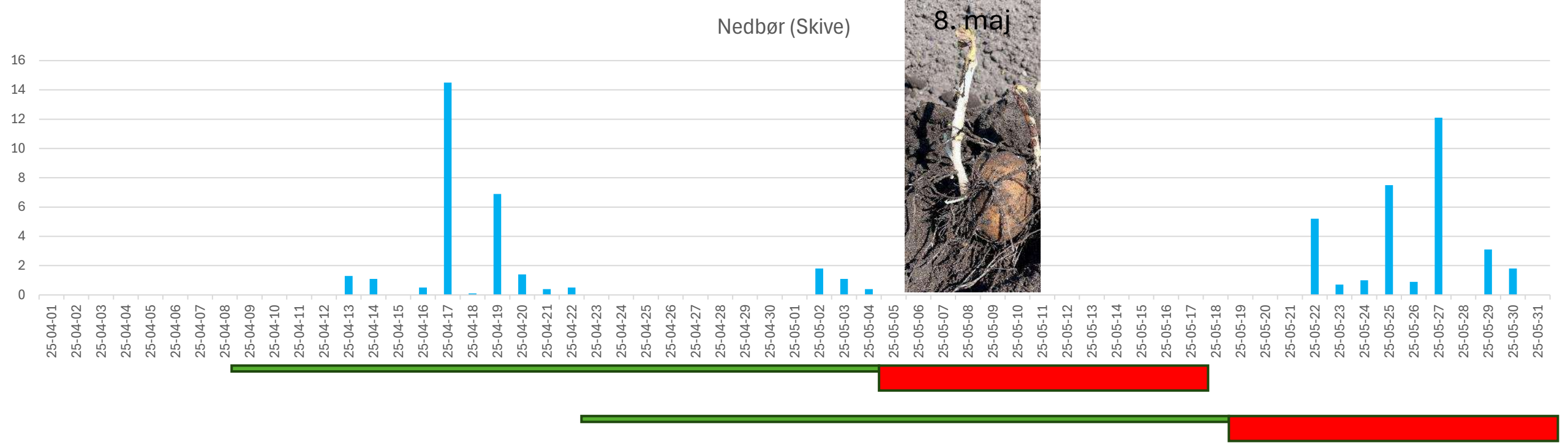
Gødskning og Skurv forsøg fra 2012 på Salling



	NPK 14-3-15	Svovlsur NH3
Brutto hkg/ha	500	481
30-55 hkg/ha	452	433



	NPK 14-3-15	Svovlsur NH3
Index	20	8
% lidt skurv	20	8
% meget skurv	10	3

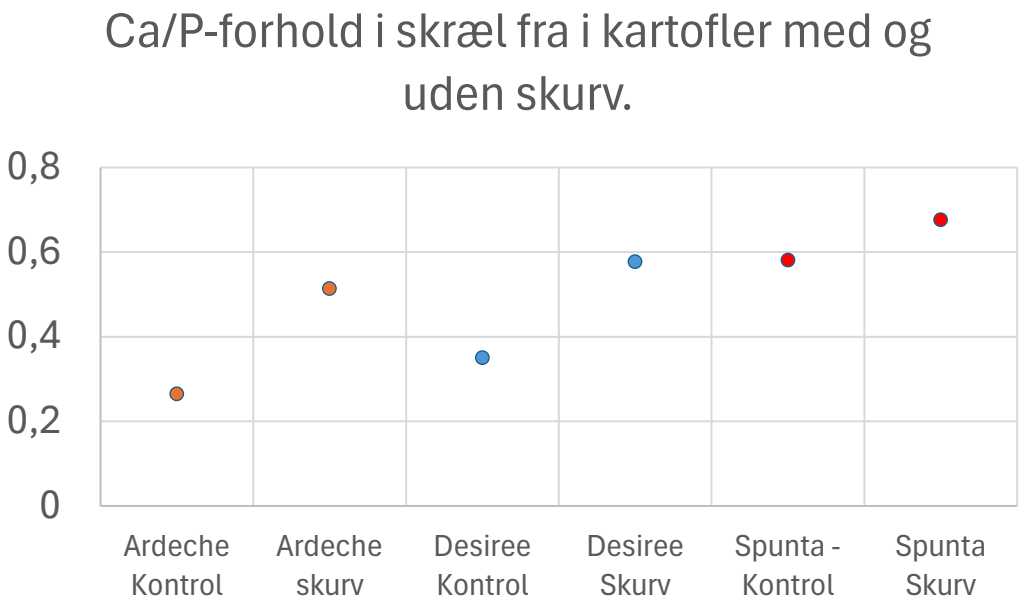


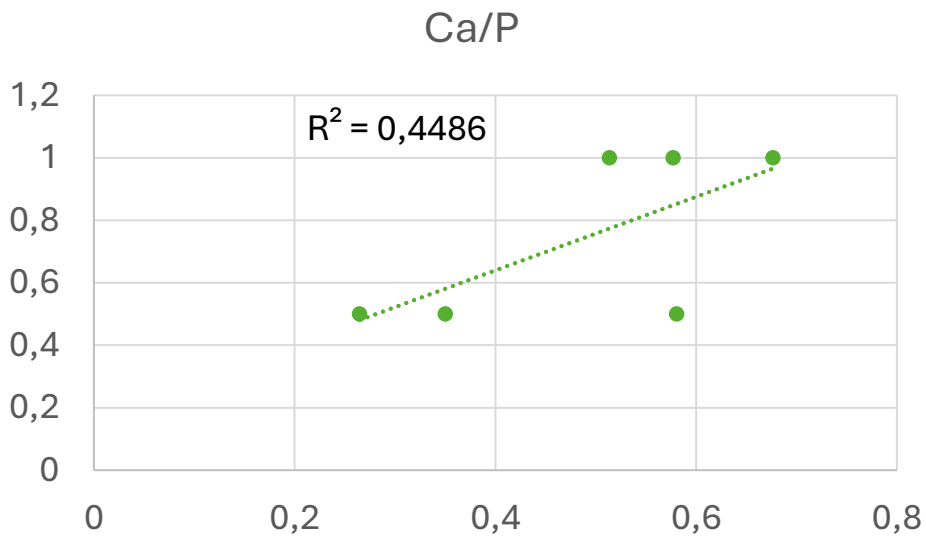
Knolddannelse 4-6 uger efter lægning – afhænger af sort og temperatur

Observationer fra 2025

- I vækstsæsonen var det tegn på en del skurv.
- Hos en enkelt avler undersøgte vi knolde med og uden skurv
- Skræl-prøver
- Jordprøver

Med udgangspunkt i gamle artikler – lave vi skrælprøver





Plante	Pøve nr.	Dato	T	N	P	K	Ca	Mg	S	Fe	Mn	Zn	Cu	B
Ardeche Kontrol	470023	10-11-2025	0,5	1,53	0,34	2,54	0,09	0,13	0,18	260	15	28	10	11
Ardeche skurv	470028	10-11-2025	1	1,45	0,37	2,6	0,19	0,13	0,18	417	17	24	10	11
Desiree Kontrol	470059	10-11-2025	0,5	2,59	0,4	4,27	0,14	0,15	0,17	683	33	30	10	16
Desiree Skurv	470058	10-11-2025	1	2,62	0,26	3,6	0,15	0,14	0,19	2364	20	26	9	18
Spunta - Kontrol	470057	10-11-2025	0,5	2,4	0,31	3,86	0,18	0,17	0,26	447	29	22	12	17
Spunta Skurv	470060	10-11-2025	1	2,15	0,34	3,96	0,23	0,15	0,26	677	50	21	12	18

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	Rt	Pt	Kt	Mgt	Cat	Skurv
444-1 N	6,5	3,8	18,5	6,7	97,4	1
444-1 S	7,0	4,2	12,6	5,3	157,3	1
442-0 N	6,4	5,1	20,1	5,6	79,2	0,5
442-0 S	6,2	5	18,7	5,6	82,9	0,5

Jordprøver

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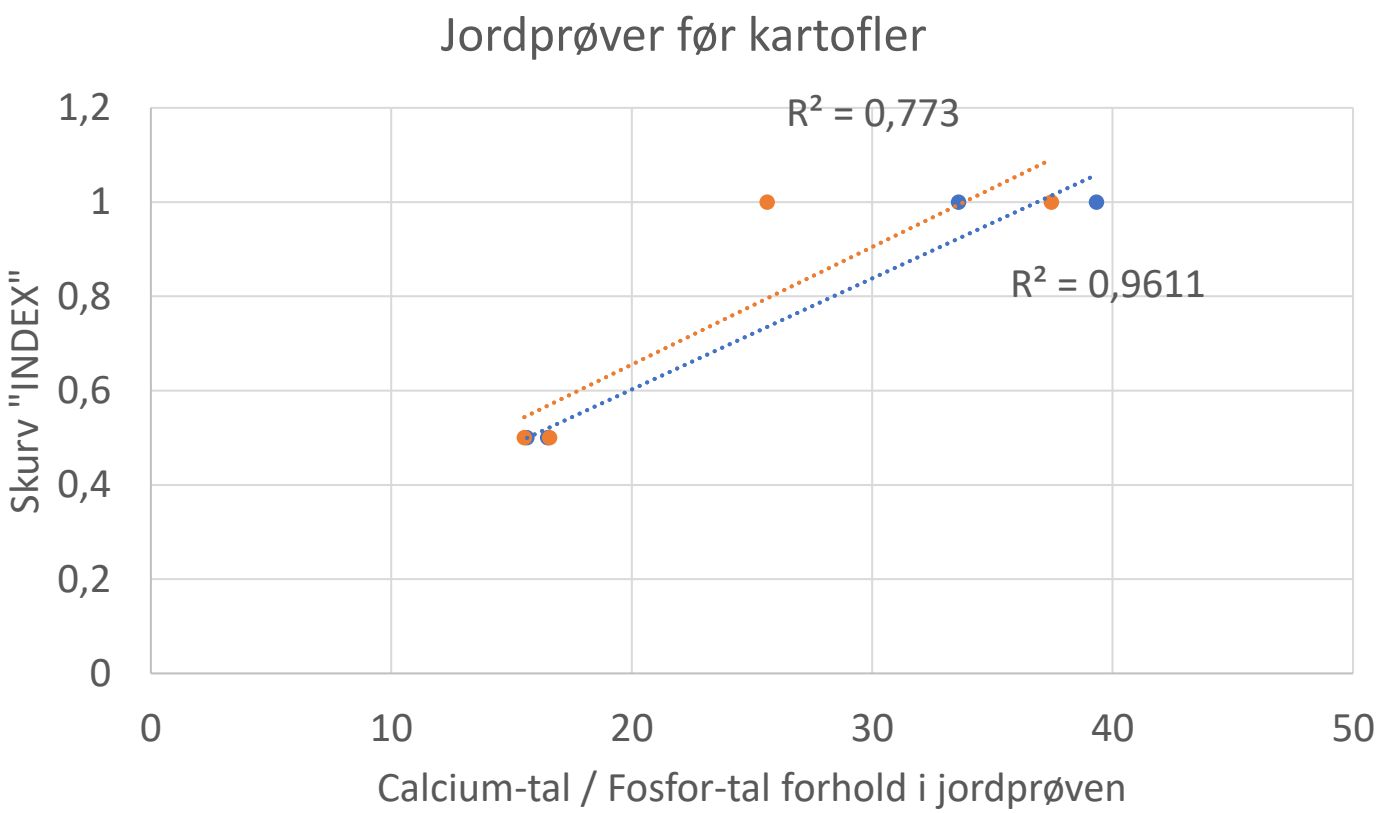

Umiddelbart en god sammenhæng – værd at forfølge om det har noget på sig!

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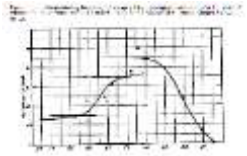
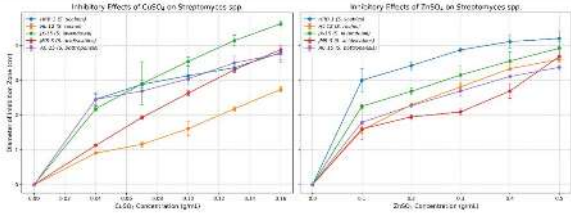
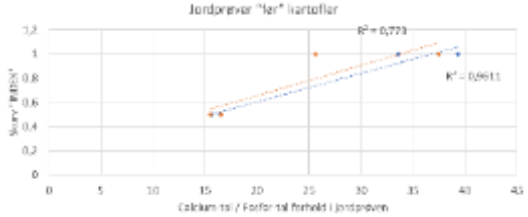
Tag med hjem





- Reaktionstal har betydning – det ved vi
- Fast kamme – øger kapilær-krafterne (Mere vand)
- Fosfor + Zink + Kobber har alle en indirekte effekt på skurv.
  - Oplagt af tage med i gødningen omkring læggekartoflen
- Fosfor er vigtigt for skinddannelse.
  - Spise og lægge kartofler tilføres blad-fosfor i de kritiske perioder, fra knolddannelse og specielt under tørre forhold.
- Plantetilgængeligt vand omkring knoldene
  - Kan måske påvirkes ved gødskning med calcium (bare ikke CaCO3)
- Fosfor og Calcium ser ud til at være vigtige parametre
  - Tydelig sammenhæng mellem skurv og Ca/p-forhold i kartoffelskræl
  - Ser ud til der også er en sammenhæng til Ca-tal/P-tal i jordprøverne
  - Jo mere calcium – jo mere fosfor skal der tilføres
- Indikationer på at KCl kan give mere skurv (Forsøg fra 1973)
- I 2026 vil vi følge marker, hvor der bliver taget Calcium-tal



Tiltag som kan reducere alm skurv

Vanding (hvis muligt)

Flex
Bladfosfor

Flex NP5-8
med Cu, B, Zn

SvovlsurNH3

TSP

Patentkali

Flex
Bladfosfor

Jordprøver
Rt
Pt
Cat
Kt
Mgt

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Lidt at gå hjem på

Drypvanding er måske fremtiden i kartofler

Demonstrationsprojekt afprøver drypvanding og flere styresystemer på tre hektar med chipkartofler.

11. JUN. 2010 08:15 Skrevet af: **Lars B. Smitt**

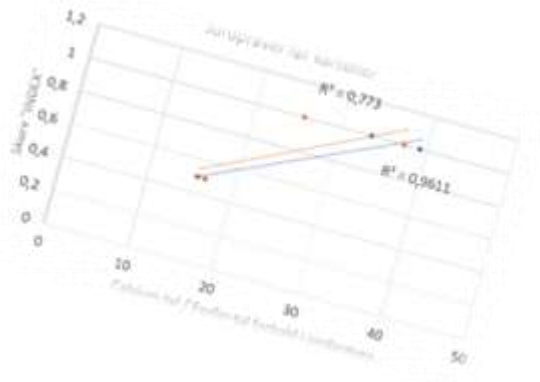
De tre styresystemer målet jordens fugtighed i to dybder i kammen. Systemerne er IrriWise (nærmest), Dacom og AquaFlex.

BJ-Agro

Hvad kan drypvanding

- Bedre udnyttelse af vandet
- Spare 1/3 af vandet
- Bedre udnyttelse af næringsstoffer
- Fertigation en mulighed
- Mindre varme stress pga fugten
- Bedre kvalitet
- Kan bliver et ”License to produce”
- Ny kvælstofregulering

Spørgsmål ?



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