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Effect of steaming/watering of large hay square bales on particulate matter generation

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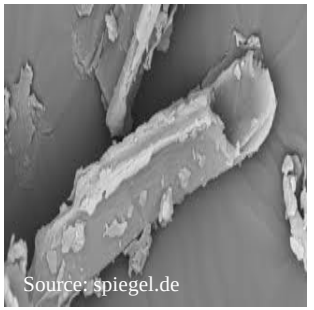
Introduction

- Increase in allergic respiratory diseases by horses (KLIER, 2011)
- Airborne particulate matter from roughage obtain as one of the three main sources of airborne particles in horse keeping systems (WATHES ET AL., 1983)
- Particle concentration, particle composition and particle size are largely responsible for the harmful/damaging effect of the particulate matter on health (u.a. LIPPMANN, 1970; FLEMING, 2008)


Source: hurkyson.eu


Source: propferd.at


Source: spiegel.de


Source: pressetext.com

Objective of the study

Aim of the study was to investigate the **effect of steaming/watering of large square bales** on the airborne particulate matter generation of hay.

Method – Experimental Procedure in Practice

1. Determination of weight and size:
   - Bale density 1:169 kg/m³
   - Bale density 2: 192 kg/m³
   - Bale density 3:164 kg/m³
2. 6 samples were punched out of the unsteamed bale
3. Bales were put in the steaming box and watered/irrigated with ~150 liters water
4. Steamed for 4 hours
5. 6 samples were punched out of the steamed bale

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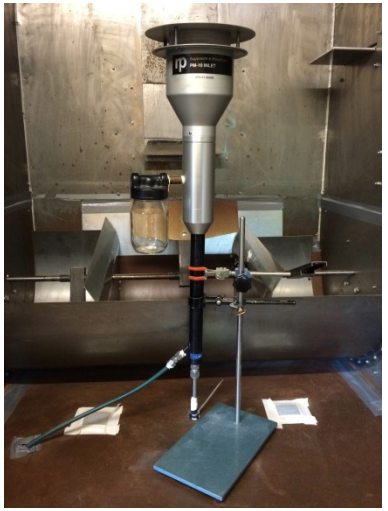
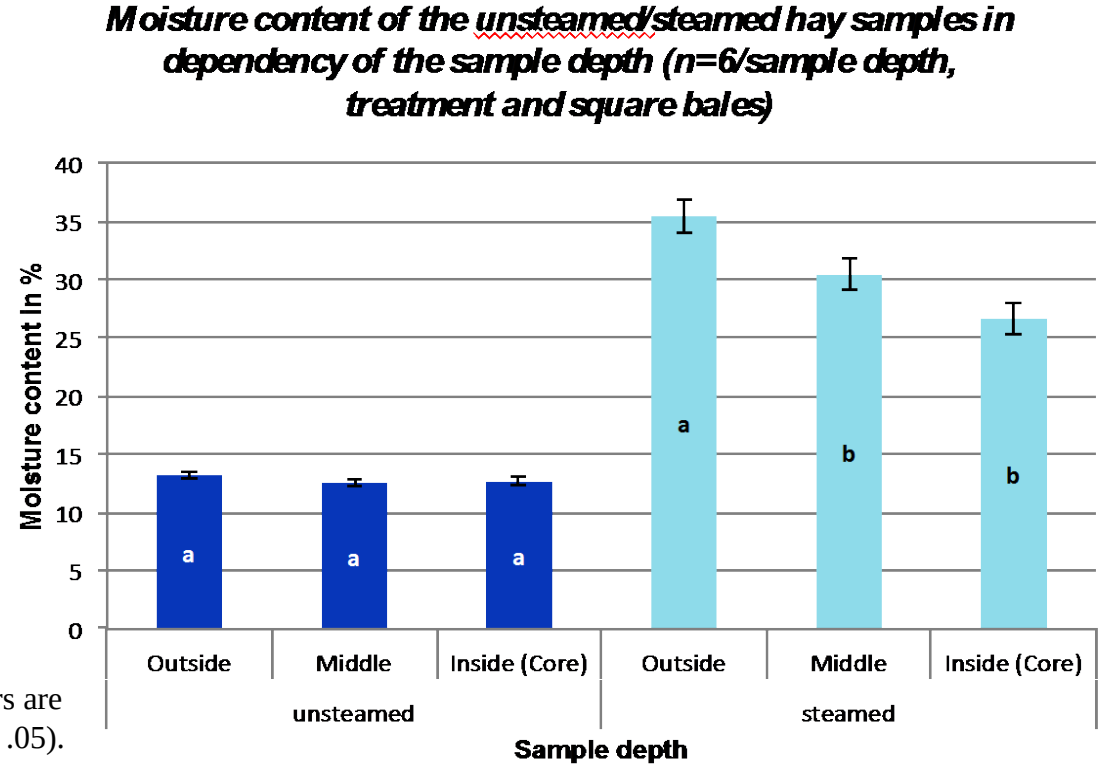
Experimental Procedure in Laboratory

1. Determination of the moisture content → drying cabinet
2. Dust measurement→ Online gravimetric measuring instrument under standardized conditions
3. Statistical analysis with SAS (proc GLM)



Outside Middle Inside (Core)

Is a homogenous steaming of a large hay square bale possible?



Means with different letters are significantly different (P < .05).

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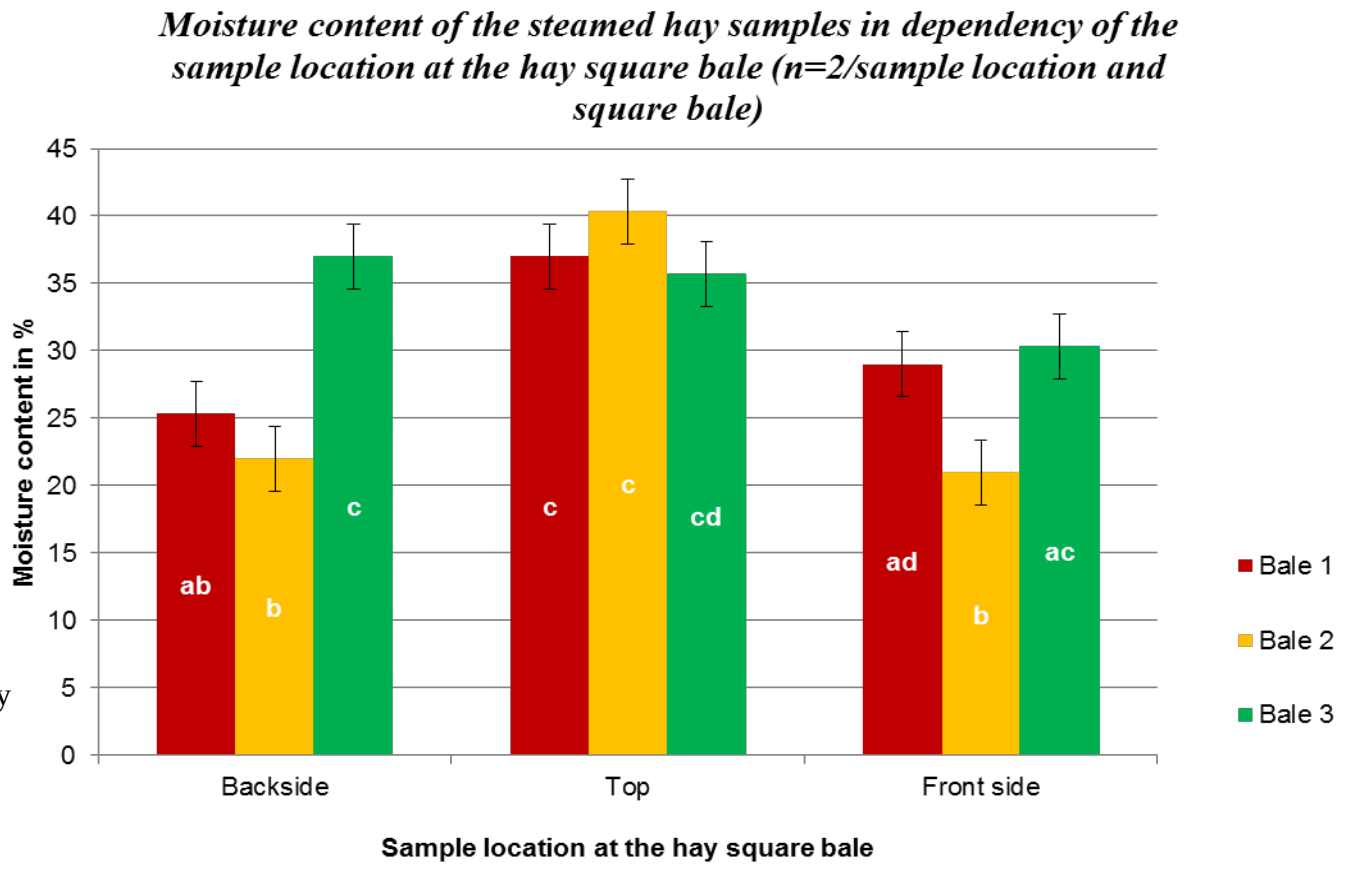
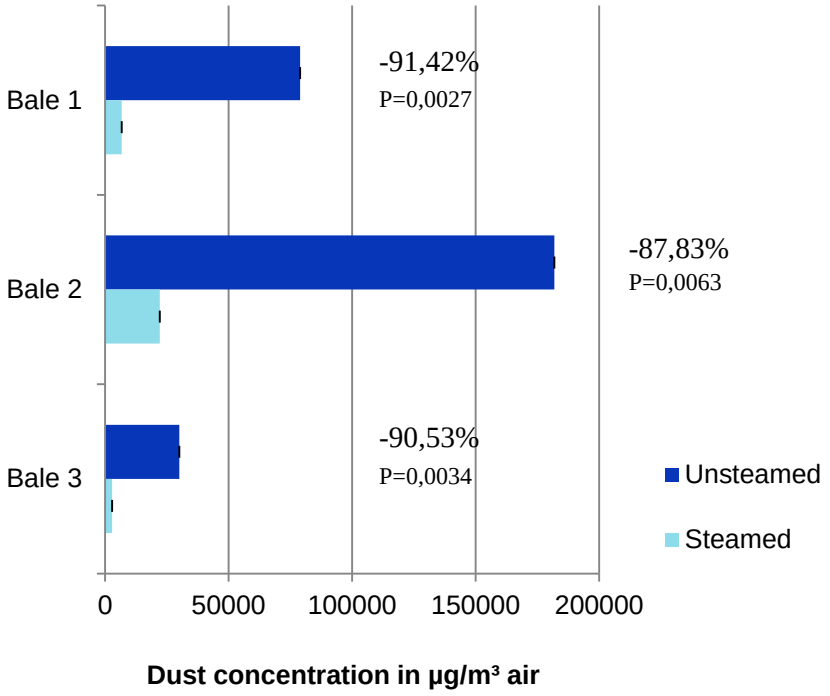


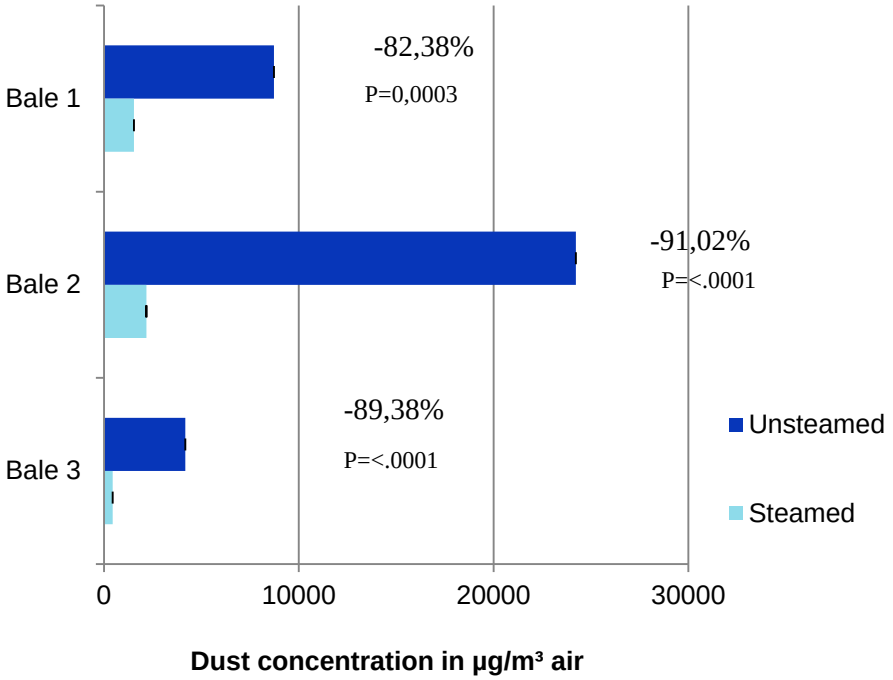
Means with different letters are significantly different (P < .05).

What influence does the moisture content have on the dust generation potential?

Steaming success on the sum of the 60-minute PM 10 generation (n=3/treatment and bale)

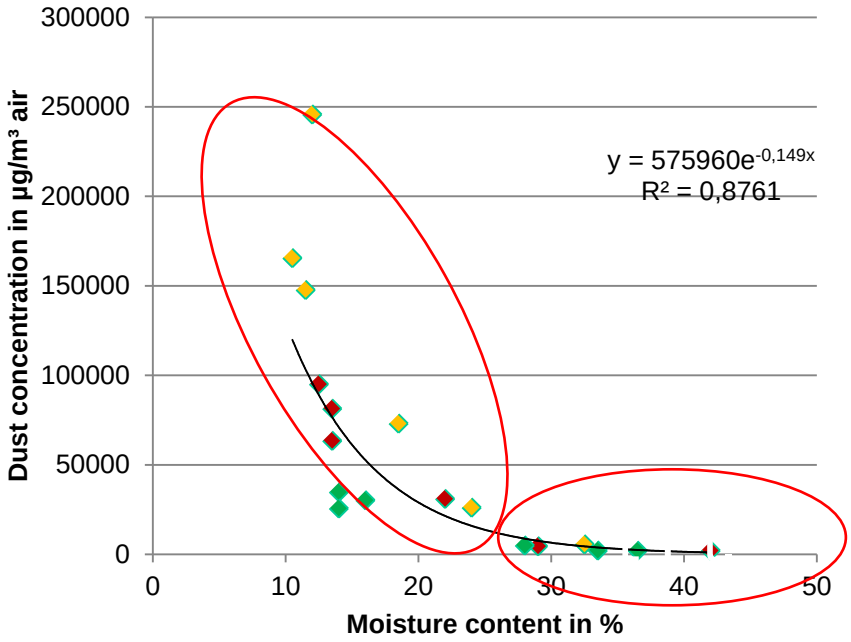


Steaming success on the sum of the 60-minute PM 2,5 generation (n=3/treatment and bale)

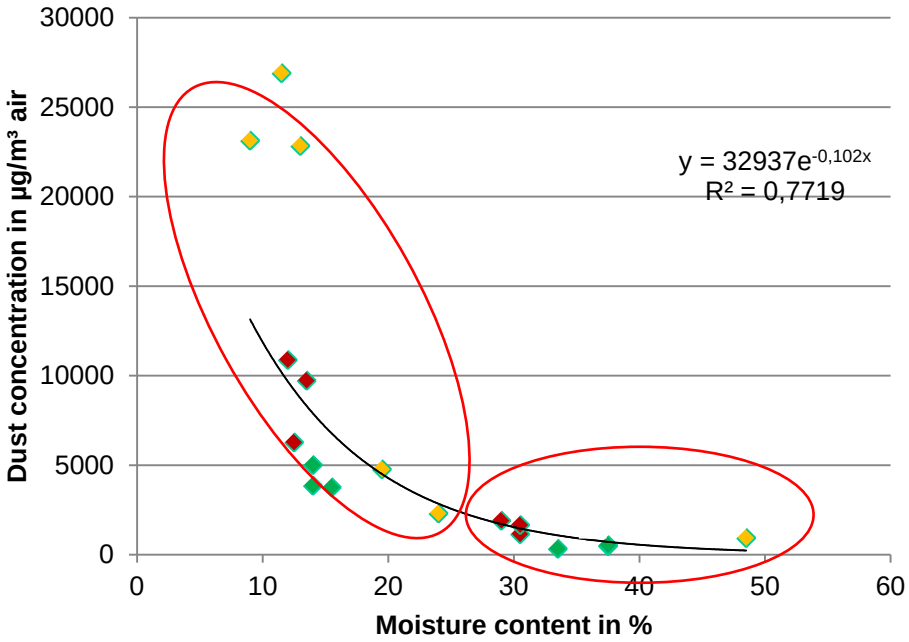


What influence does the moisture content have on the dust generation potential?

PM 10 concentration (60 minutes/measurement) in dependency of the moisture content



PM 2,5 concentration (60 minutes/measurement) in dependency of the moisture content



Conclusion

- The results of this study indicate that vapour distribution within the steamed/watered bales are not satisfying so far.

- However, a significant reduction of at least 87% of PM 10 and PM 2.5 airborne particular matter has been achieved.

Thank you very much for your attention and interest!

References

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Hay Sample Locations