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# Science & Solutions

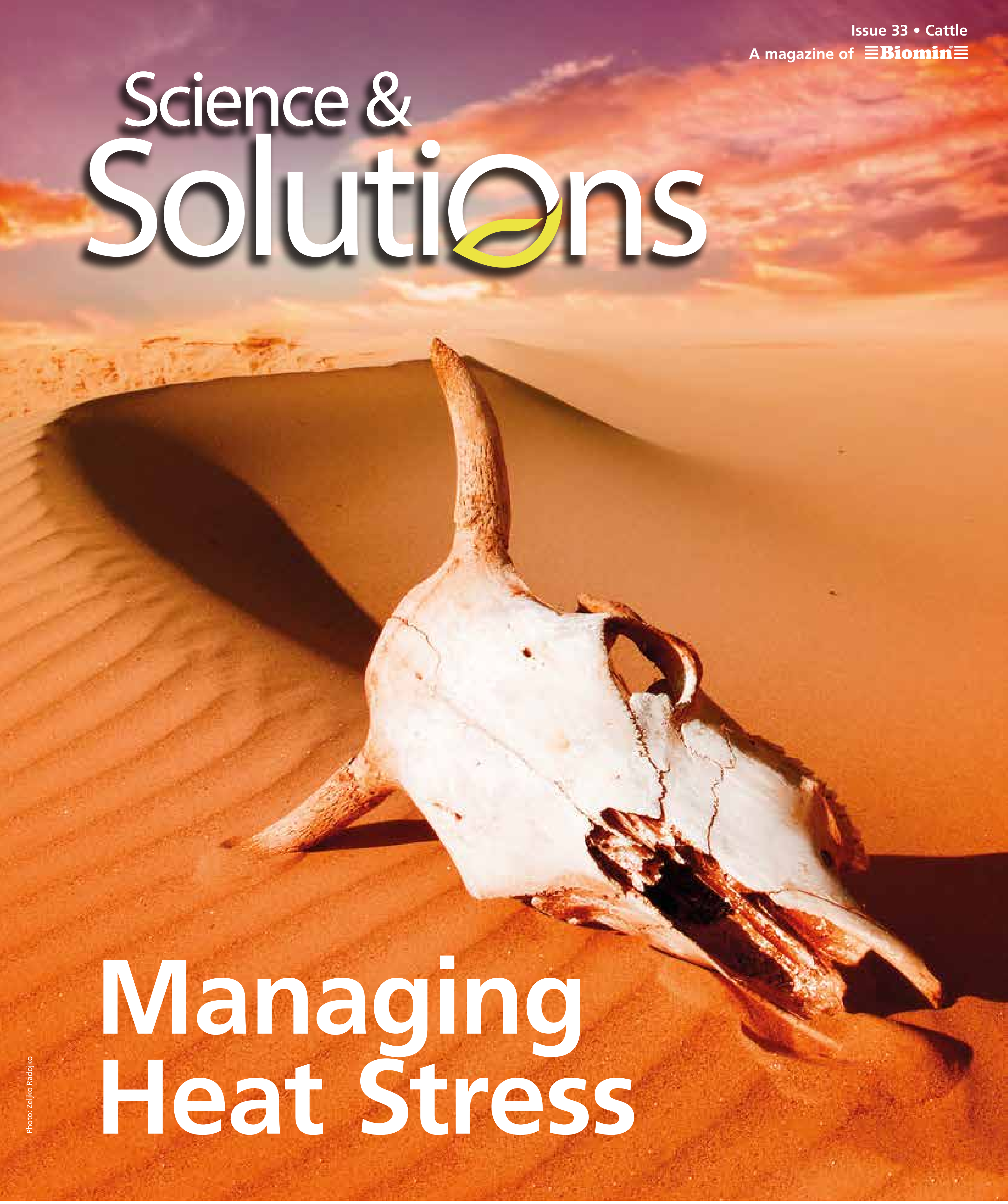

Photo: Zeljko Radojko

# Managing Heat Stress

Photo: COSPV

## Grass to Save Cash

Photo: fotolia.com

## What's Wrong with My Herd?

Part 1: Breeding Difficulties

# Editorial

## Summertime Blues

Summer is the favorite season of many people, except maybe those who are working with dairy cows. As the optimal temperature threshold of the milk production is around 20°C, the first signs of heat stress begin to appear in May. Last year we experienced the longest and hottest summer in written history, and we can probably expect something similar this year.

We can't start preparing for the summer heat too soon. Lower milk yield, impaired fertility and disturbances in the metabolism are only some of the many symptoms that can occur in higher temperatures.

While we cannot control the weather, we can be proactive to avoid its negative effects on the health of our animals and our wallets. Good quality feed materials and excellent management are crucial these days when the appetite of the animals is diminished.

In this issue of **Science & Solutions**, we share our tips on an unfairly unnoticed roughage: grass silage. We talk about heat stress and its effects on dairy herds, and we give some hints about how to minimize them. Furthermore, we launch a new series of practical guidance for dairy farmers with handy and easy-to-use checklists, starting with breeding difficulties.

So, grab a nice and cool drink and get prepared for the summer with us!

**Istvan CSUTORAS**
Product Manager Phytogenics

# Contents




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Illustration: Adriana3d

# Heat Stress
## Management of Dairy Cows

By **Annamaria Boczonadi**, Product Manager Microbials

Lower production and other consequences of heat stress can begin at a temperature of just 22°C. Here are tips to cope with the challenge.

Modern dairy breeds like the Holstein Friesian breed are developed in northern countries, meaning they are tolerant towards cold weather conditions but susceptible to heat. In many areas around the world, summers are hot and long. This is not only a challenge to humans but even more so for dairy cows, as they are already exposed to heat stress when temperatures rise above 22°C, especially when accompanied by high humidity. *Table 1* illustrates the various levels of heat stress in dairy cows according to the temperature-humidity index (THI).

### Effects of heat stress

With rising outdoor temperatures, a cow's body temperature also rises. This comes along with an increase in respiratory rate, salivation and water consumption, indicating noticeable discomfort. What follows is usually a drop in dry matter intake (DMI), milk yield and milk fat production, and impaired reproductive performance. High producing and fresh cows are particularly affected; however, heat stress also has an underestimated negative effect on dry cows and heifers.

Several physiological changes are connected to heat stress in dairy cows. For example, the alteration of blood flow distribution towards the peripheral tissues helps the cow cope with the heat by increasing heat loss. Panting is also a way of cooling the body, which is important for cattle as their ability to sweat is limited. However, with increased panting, the acid-base balance and pH of the blood might be altered, possibly leading to respiratory alkalosis. On the other hand, the shift towards higher proportions of grain in summer diets might influence the rumen and result in rumen acidosis. As such, the subsequent drop in DMI and milk yield and failures in reproductive performance are not surprising.

### Chilling out

It is therefore necessary to minimize the effects of heat stress through an integrated solution of management, cow comfort and nutrition. *Table 2* provides tips to counteract heat stress.

Talking about cow comfort, it is important to protect dairy cows from exposure to direct sun and provide adequate shade. Availability of water is another important issue when minimizing the effects of heat stress. Attention should be given to ensure that water is clean and easily accessible. Therefore, water troughs should be cleaned regularly and placed at multiple locations in the barns, holding pens, travel alleys and feeding area. Cows should also have water easily available right after milking, so it might be necessary to place extra water source on the way back from the milking parlor.

Under extreme weather conditions, feeding regimes might have to be adjusted in order to maximize feed intake. Cows might refuse to eat during hot daytime when sun radiation is strong. They are more likely to consume feed when radiation is moderate and the temperature cools down, for example during the night. Therefore, it might be advantageous to reschedule feeding times and to feed 40% of the daily ration early in the morning and 60% late in the afternoon/evening, giving cows access to fresh feed when they are more likely to consume it.

***Table 1***. Heat stress and temperature humidity index (THI).

| Themperature | | | | | | | | | | % Relative Humidity | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| °F | °C | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
| 72 | 22.0 | 64 | 65 | 65 | 65 | 66 | 66 | 67 | 67 | 67 | 68 | 68 | 69 | 69 | 69 | 70 | 70 | 70 | 71 | 71 | 72 | 72 |
| 73 | 23.0 | 65 | 65 | 66 | 66 | 66 | 67 | 67 | 68 | 68 | 68 | 69 | 69 | 70 | 70 | 71 | 71 | 71 | 72 | 72 | 73 | 73 |
| 74 | 23.5 | 65 | 66 | 66 | 67 | 67 | 67 | 68 | 68 | 69 | 69 | 70 | 70 | 70 | 71 | 71 | 72 | 72 | 73 | 73 | 74 | 74 |
| 75 | 24.0 | 66 | 66 | 67 | 67 | 68 | 68 | 68 | 69 | 69 | 70 | 70 | 71 | 71 | 72 | 72 | 73 | 73 | 74 | 74 | 75 | 75 |
| 76 | 24.5 | 66 | 67 | 67 | 68 | 68 | 69 | 69 | 70 | 70 | 71 | 71 | 72 | 72 | 73 | 73 | 74 | 74 | 75 | 75 | 76 | 76 |
| 77 | 25.0 | 67 | 67 | 68 | 68 | 69 | 69 | 70 | 70 | 71 | 71 | 72 | 72 | 73 | 73 | 74 | 74 | 75 | 75 | 76 | 76 | 77 |
| 78 | 25.5 | 67 | 68 | 68 | 69 | 69 | 70 | 70 | 71 | 71 | 72 | 73 | 73 | 74 | 74 | 75 | 75 | 76 | 76 | 77 | 77 | 78 |
| 79 | 26.0 | 67 | 68 | 69 | 69 | 70 | 70 | 71 | 71 | 72 | 73 | 73 | 74 | 74 | 75 | 76 | 76 | 77 | 77 | 78 | 78 | 79 |
| 80 | 26.5 | 68 | 69 | 69 | 70 | 70 | 71 | 72 | 72 | 73 | 73 | 74 | 75 | 75 | 76 | 76 | 77 | 78 | 78 | 79 | 79 | 80 |
| 81 | 27.0 | 68 | 69 | 70 | 70 | 71 | 72 | 72 | 73 | 73 | 74 | 75 | 75 | 76 | 77 | 77 | 78 | 78 | 79 | 80 | 80 | 81 |
| 82 | 28.0 | 69 | 69 | 70 | 71 | 71 | 72 | 73 | 73 | 74 | 75 | 75 | 76 | 77 | 77 | 78 | 79 | 79 | 80 | 81 | 81 | 82 |
| 83 | 28.5 | 69 | 70 | 71 | 71 | 72 | 73 | 73 | 74 | 75 | 75 | 76 | 77 | 78 | 78 | 79 | 80 | 80 | 81 | 82 | 82 | 83 |
| 84 | 29.0 | 70 | 70 | 71 | 72 | 73 | 73 | 74 | 75 | 75 | 76 | 77 | 78 | 78 | 79 | 80 | 80 | 81 | 82 | 83 | 83 | 84 |
| 85 | 29.5 | 70 | 71 | 72 | 72 | 73 | 74 | 75 | 75 | 76 | 77 | 78 | 78 | 79 | 80 | 81 | 81 | 82 | 83 | 84 | 84 | 85 |
| 86 | 30.0 | 71 | 71 | 72 | 73 | 74 | 74 | 75 | 76 | 77 | 78 | 78 | 79 | 80 | 81 | 81 | 82 | 83 | 84 | 84 | 85 | 86 |
| 87 | 30.5 | 71 | 72 | 73 | 73 | 74 | 75 | 76 | 77 | 77 | 78 | 79 | 80 | 81 | 81 | 82 | 83 | 84 | 85 | 85 | 86 | 87 |
| 88 | 31.0 | 72 | 72 | 73 | 74 | 75 | 76 | 76 | 77 | 78 | 79 | 80 | 81 | 81 | 82 | 83 | 84 | 85 | 8 | 86 | 87 | 88 |
| 89 | 31.5 | 72 | 73 | 74 | 75 | 75 | 76 | 77 | 78 | 79 | 80 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 86 | 87 | 88 | 89 |
| 90 | 32.0 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 86 | 87 | 88 | 89 | 90 |
| 91 | 33.0 | 73 | 74 | 75 | 76 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 86 | 87 | 88 | 89 | 90 | 91 |
| 92 | 33.5 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 |
| 93 | 34.0 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 80 | 81 | 82 | 83 | 85 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 |
| 94 | 34.5 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 86 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 |
| 95 | 35.0 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 |
| 96 | 35.5 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 |
| 97 | 36.0 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 91 | 92 | 93 | 94 | 95 | 96 | 97 |
| 98 | 36.5 | 76 | 77 | 78 | 80 | 80 | 82 | 83 | 83 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 98 |
| 99 | 37.0 | 76 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 98 | 99 |
| 100 | 38.0 | 77 | 78 | 79 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 98 | 99 | 100 |
| 101 | 38.5 | 77 | 79 | 80 | 81 | 82 | 83 | 84 | 86 | 87 | 88 | 89 | 90 | 92 | 93 | 94 | 95 | 96 | 98 | 99 | 100 | 101 |
| 102 | 39.0 | 78 | 79 | 80 | 82 | 83 | 84 | 85 | 86 | 87 | 89 | 90 | 91 | 92 | 94 | 95 | 96 | 97 | 98 | 100 | 101 | 102 |
| 103 | 39.5 | 78 | 79 | 81 | 82 | 83 | 84 | 86 | 87 | 88 | 89 | 91 | 92 | 93 | 94 | 96 | 97 | 98 | 99 | 101 | 102 | 103 |
| 104 | 40.0 | 79 | 80 | 81 | 83 | 84 | 85 | 86 | 88 | 89 | 90 | 91 | 93 | 94 | 95 | 96 | 98 | 99 | 100 | 101 | 103 | 104 |
| 105 | 40.5 | 79 | 80 | 82 | 83 | 84 | 86 | 87 | 88 | 89 | 91 | 92 | 93 | 95 | 96 | 97 | 99 | 100 | 101 | 102 | 103 | 105 |
| 106 | 41.0 | 80 | 81 | 82 | 84 | 85 | 87 | 88 | 89 | 90 | 91 | 93 | 94 | 95 | 97 | 98 | 99 | 101 | 102 | 103 | 104 | 106 |
| 107 | 41.5 | 80 | 81 | 83 | 84 | 85 | 87 | 88 | 89 | 91 | 92 | 94 | 95 | 96 | 98 | 99 | 100 | 102 | 103 | 104 | 106 | 107 |
| 108 | 42.0 | 81 | 82 | 83 | 85 | 86 | 88 | 89 | 90 | 92 | 93 | 94 | 96 | 97 | 98 | 100 | 101 | 103 | 104 | 105 | 107 | 108 |
| 109 | 43.0 | 81 | 82 | 84 | 85 | 87 | 89 | 89 | 91 | 92 | 94 | 95 | 96 | 98 | 99 | 101 | 102 | 103 | 105 | 106 | 108 | 109 |
| 110 | 43.5 | 81 | 83 | 84 | 86 | 87 | 89 | 90 | 91 | 93 | 94 | 96 | 97 | 99 | 100 | 101 | 103 | 104 | 106 | 107 | 109 | 110 |
| 111 | 44.0 | 82 | 83 | 85 | 86 | 88 | 90 | 91 | 92 | 94 | 95 | 96 | 98 | 99 | 101 | 102 | 104 | 105 | 107 | 108 | 110 | 111 |
| 112 | 44.5 | 82 | 84 | 85 | 87 | 88 | 90 | 91 | 93 | 94 | 96 | 97 | 99 | 100 | 102 | 103 | 105 | 106 | 108 | 109 | 111 | 112 |
| 113 | 45.0 | 83 | 84 | 86 | 87 | 89 | 91 | 92 | 93 | 95 | 96 | 98 | 99 | 101 | 102 | 104 | 105 | 107 | 108 | 110 | 111 | 113 |
| 114 | 45.5 | 83 | 85 | 86 | 88 | 89 | 92 | 92 | 94 | 96 | 97 | 99 | 100 | 102 | 103 | 105 | 106 | 108 | 109 | 111 | 112 | 114 |
| 115 | 46.0 | 84 | 85 | 87 | 88 | 90 | 92 | 93 | 95 | 96 | 98 | 99 | 101 | 102 | 104 | 106 | 107 | 109 | 110 | 112 | 113 | 115 |
| 116 | 46.5 | 84 | 86 | 87 | 89 | 90 | 93 | 94 | 95 | 97 | 98 | 100 | 102 | 103 | 105 | 106 | 108 | 110 | 111 | 113 | 114 | 116 |
| 117 | 47.0 | 85 | 86 | 88 | 89 | 91 | 93 | 94 | 96 | 98 | 99 | 101 | 102 | 104 | 106 | 107 | 109 | 111 | 112 | 114 | 115 | 117 |
| 118 | 48.0 | 85 | 87 | 88 | 90 | 92 | 94 | 95 | 97 | 98 | 100 | 102 | 103 | 105 | 106 | 108 | 110 | 111 | 113 | 115 | 116 | 118 |
| 119 | 48.5 | 85 | 87 | 89 | 90 | 92 | 94 | 96 | 87 | 99 | 101 | 102 | 104 | 106 | 107 | 109 | 111 | 112 | 114 | 116 | 117 | 119 |
| 120 | 49.0 | 86 | 88 | 89 | 91 | 93 | 95 | 96 | 98 | 100 | 101 | 103 | 105 | 106 | 108 | 110 | 111 | 113 | 115 | 117 | 118 | 120 |

**Stress Threshold**
Respiration rate exceeds 60 BPM
Milk yield losses begin
Reproductive losses detectable
Rectal temperature exceeds 38.5°C (101.3°F)

**Mild-Moderate Stress**
Respiration rate exceeds 75 BPM
Rectal temperature exceeds 39°C (102.2°F)

**Moderate-Severe Stress**
Respiration rate exceeds 85 BPM
Rectal temperature exceeds 40°C (104°F)

**Severe Stress**
Respiration rate 120-140 BPM
Rectal temperature exceeds 41°C (106°F)

*Source: Collier et al, 2012, Arkansas University*

**Annamaria Boczonadi**
Product Manager Microbials

**Feed additives like Levabon® and Digestarom® can be valuable tools that help to support DMI, increase digestibility and gastrointestinal comfort, thus minimizing the negative effects associated with hot and humid environmental conditions.**

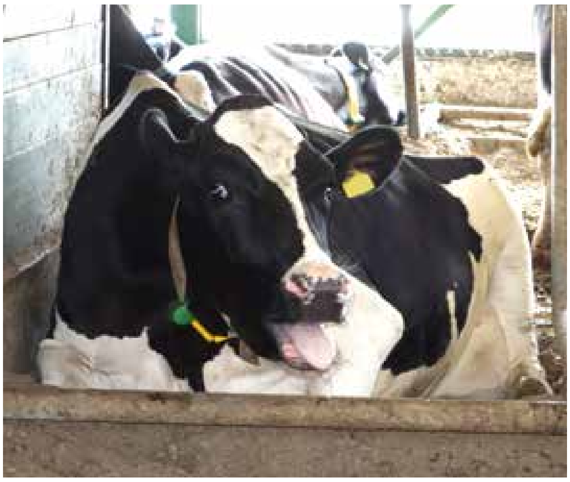
***Table 2.*** Tips to counteract heat stress

| |
|---|
| Provide adequate shade |
| Provide adequate clean water, especially after milking |
| Split daily ration: 40% early morning 60% late afternoon |
| Supply high quality forage |
| Use Levabon® Rumen |
| Use Digestarom® |

Cows under heat stress have depressed DMI; simultaneously they have similar, if not slightly higher requirements for different nutrients. Therefore, adjustments in diet composition might be needed in order to meet these requirements and prevent high milk yield losses.

To choose the proper diet composition under heat stress is a challenge. On the one hand, a reduced forage-to-concentrate ratio supports DMI and increases nutrient density. On the other hand, fiber content should not be compromised too much, as this may easily lead to acidotic conditions in the rumen. If this pH drop prevails for too long, acute ruminal acidosis might be the result. Thus, at times of heat stress the best quality forage, with easily fermentable fiber and high digestibility, should be supplied. Another beneficial tool is to add autolyzed yeast, like Levabon® Rumen, to the diet in order to stabilize rumen pH and thus support gastrointestinal comfort.

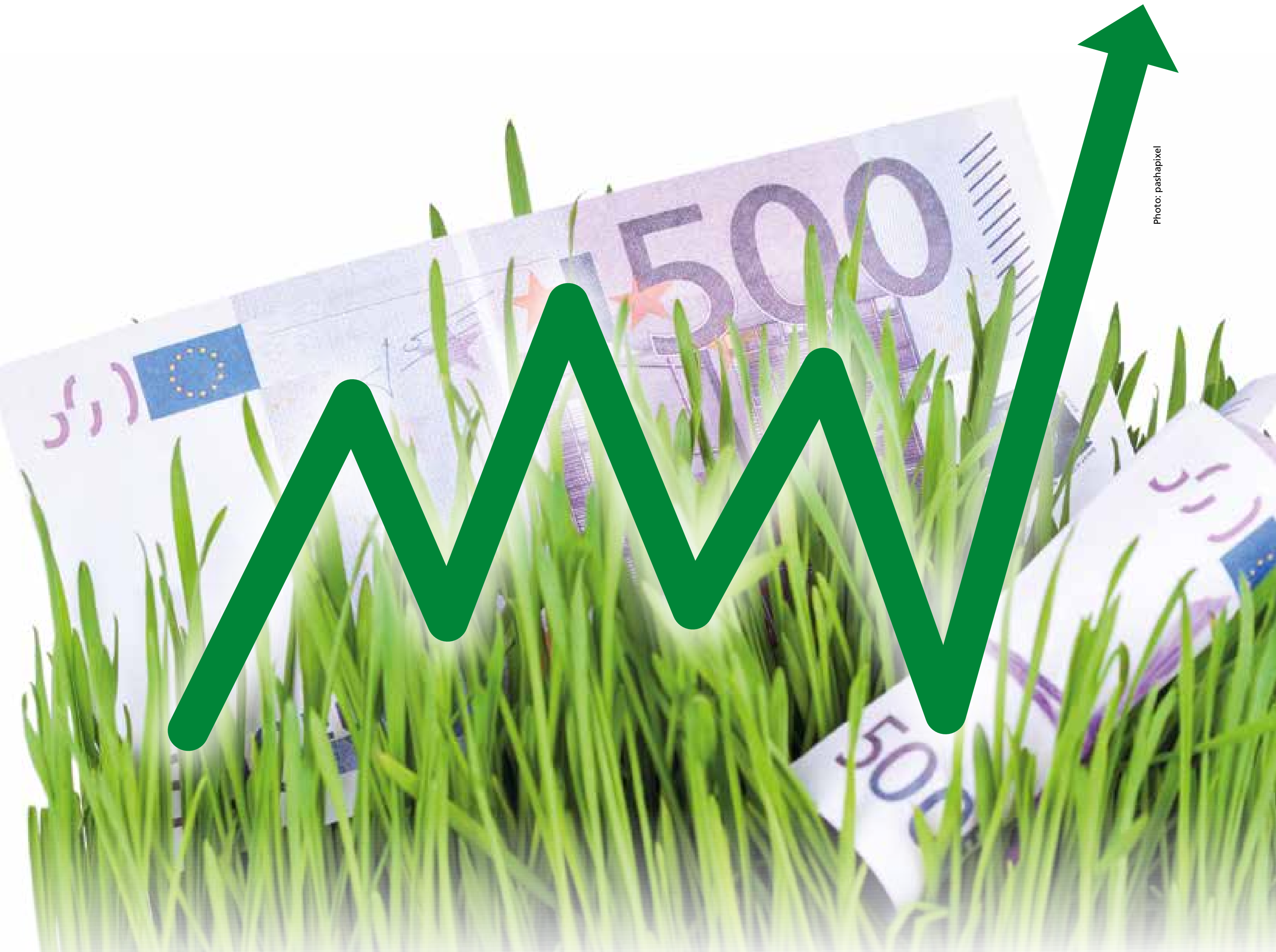
To meet the energy requirements of heat stressed cows with a reduced feed intake, besides increasing the concentrate-to-forage ratio, other solutions that can help to increase nutrient digestibility are also helpful. The supplementation with autolyzed yeast, Levabon® Rumen, might be beneficial, as it enhances rumen efficiency by getting more nutrients from the same amount of feed. The aim is to help the dairy cow maintain ruminal and digestive comfort and to minimize feed consumption losses. Levabon® Rumen helps to improve digestibility in cows and efficient feed utilization, even under non-optimal environmental conditions. Unlike yeast cultures, autolyzed yeast consists of pure yeast without carrier, readily available for rumen microflora as cells are already broken-up because of the autolysis (self-digestion) process. This supplies high quality nutrients to rumen microbiota like B-vitamins, peptides, amino acids and functional components like nucleotides, enzymes and cell-wall carbohydrates (mannan, glucan). They help to maintain ruminal and intestinal comfort and health, especially important under heat stress conditions. Additionally, Digestarom® —a phytogenic feed additive— helps to support DMI by stimulating feed intake and preventing sharp drops in DM consumption.



**A heat stressed dairy cow**

## Conclusion

An integrated solution should be applied to minimize production and profitability losses associated with the effects of heat stress in dairy cows. This should include cow comfort, by providing animals with a comfortable environment and access to water, adjusted feeding management and necessary diet modifications. Feed additives like Levabon® and Digestarom® can be valuable tools that help to support DMI, increase digestibility and gastrointestinal comfort, thus minimizing the negative effects associated with hot and humid environmental conditions.




# Grass to Save Cash

By **Zanetta Chodorowska**, Ruminant Technical Manager

Grass silage is an often overlooked alternative to purchased grain or corn (maize) silage that can support healthy, high-producing dairy herds while reducing feed costs—provided that it is ensiled correctly. Here's how to use grass to save cash on your farm.

Grass silage has been unfairly treated: it is often excluded from the ration for a too high fiber content and low digestibility that can reduce feed intake and milk production. Yet, this poor reputation is largely undeserved. Grasses are an inexpensive and market-independent diet ingredient that, if managed properly, provide a good source of protein. They are suited to a wide range of soils and climates, and have the added benefit of being frost resistant. Compared to alfalfa, grasses are less sensitive to pests and dry faster than alfalfa. They often need just 24 hours for wilting, and even less in hot summer months. They also provide

*Table 1*. Benefits of properly ensilaged grasses for cows.

| |
|---|
| 1. Constitute a highly palatable diet ingredient |
| 2. Maintain a healthy rumen environment via the scratching ability |
| 3. Shift rumen fermentation from NFC to NDF without reducing the overall digestibility of the diet |
| 4. Improve milk composition, especially fat content |
| 5. Lower incidence of acidosis and metabolic disorders |

*Source: BIOMIN*

*Table 2*. Ration from 16 farms with high forage percentage.

| Heard | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Milk | 36 | 41 | 34 | 41 | 38 | 41 | 43 | 36 | 45 | 36 | 37 | 34 | 43 | 38 | 38 | 38 |
| % Forage | 58 | 58 | 59 | 59 | 67 | 58 | 63 | 58 | 82 | 62 | 57 | 69 | 63 | 57 | 66 | 65 |
| F-NDF intake BW | 0.93 | 1.06 | 1.04 | 0.96 | 1.16 | 0.88 | 0.98 | 1.04 | 1 | 1.02 | 0.85 | 1.1 | 1 | 1.02 | 0.94 | 0.97 |
| Mcal/kg | 1.69 | 1.71 | 1.7 | 1.67 | 1.65 | 1.67 | 1.71 | 1.67 | 1.69 | 1.71 | 1.71 | 1.62 | 1.75 | 1.67 | 1.69 | 1.76 |
| CP % DM | 17.8 | 18.0 | 16.2 | 18.3 | 17 | 18 | 17.8 | 17.6 | 18.2 | 16.4 | 18.2 | 16.8 | 18.6 | 16.8 | 17.7 | 18.5 |
| Sol. protein % CP | 39 | 39 | 40 | 37 | 38 | 35 | 38 | 34 | 37 | 37 | 26 | 39 | 39 | 44 | 41 | 36 |
| NDF % DM | 31.2 | 32 | 31.4 | 35 | 34.5 | 32 | 30.6 | 34.3 | 32 | 37 | 32 | 36 | 33 | 30.4 | 30.7 | 30 |
| F-NDF % DM | 24.8 | 24.4 | 27 | 26.4 | 26 | 25 | 25.4 | 28 | 25.8 | 28 | 24.6 | 28 | 26 | 24 | 24.5 | 25 |
| NFC % DM | 41 | 37 | 39 | 35 | 38 | 41 | 42 | 38 | 40 | 40 | 40.6 | 38 | 41 | 42.8 | 41.6 | 41 |
| Starch % DM | 26 | | | | | 25 | 24 | | | | 29 | | 24.8 | 30.7 | | 26.7 |
| Fat % DM | 4 | 5.5 | 5.5 | 5 | 4.5 | 3.8 | 3.9 | 4.5 | 4.8 | 4.1 | 4.1 | 3.8 | 4 | 5.2 | 4.4 | 4.7 |

*Source: Department of Animal Science at Cornell University, 2004-2005.*

an additional option for applying manure. *Table 1* lists the benefits of properly ensilaged grasses for cows, including high palatability, better gut health, improved milk composition and lower incidence of acidosis and metabolic disorders. The shift in rumen fermentation from non-fiber carbohydrate (NFC) to neutral detergent fiber (NDF) is particularly advantageous when mixed with high energy ingredients.

## Cost-saving switch

Feed costs account for 55% to 70% of dairy operation expenses. By replacing purchased grain with forage produced in-house, the cost of the operation can be brought down significantly without compromising intake, passage rate and milk production. This is not wishful thinking. A number of farms across the world base their feed on 60% to 75% forage while maintaining high milk production of 35 to 45 l/day with optimum 25% to 35% neutral detergent fiber in the ration (*Table 2*). These farms are just as likely to use corn or grass silages.

## A ration perspective

In the ration, grasses provide higher fiber content and have good interaction with corn silage, which is lower in fiber and higher in non-fiber carbohydrates (in the grain portion). Grasses also have a higher proportion of digestible fiber compared to corn silage or alfalfa alone. They are a high-energy forage, making them a good alternative to the widely used straw. The fact that grasses slow the passage rate of feed through the cow is beneficial for those with lower nutrient demands, such as late-lactation cows, dry cows and heifers. Another reason to consider late-harvest grasses in rations for late lactation and dry cows is the lower potassium content of mature grass.

## Tips for ensiling grass

1. For early to mid -lactation cows, diet grasses should be harvest late vegetative to early boot stage (see *Table 3*). This helps ensure that passage rate and intake are not impaired.
2. Grass should also be wilted down to between 70% and 55% moisture.
3. Cutting height should be 7 to 8 cm and length 5 cm.
4. Pay special attention to soil contamination.
5. Avoid manure spreading before harvest.
6. Use an inoculant to control the fermentation process and ensure good palatability.

***Table 3***. Grass stages of maturity, chemical compositions.

| Stage of maturity | Definition | Physical Description | Typical chemical composition | | |
|---|---|---|---|---|---|
| | | | crude protein | acid-detergent fiber | neutral-detergent fiber |
| Pro head | Late vegetative to early boot | 50% or more leaves green; less then 5% freight material | >18 | <33 | <55 |
| Early head | Boot to early head | 40% or more leaves light green to green | 13 - 18 | 33 - 38 | 55 - 60 |
| Head | Head to milk | 30% or more leaves yellow green | 8 - 12 | 39 - 41 | 61 - 65 |
| Post head | Dough to seed | 20% or more leaves; brown to green | <8 | >41 | >65 |

*Source: Rohweder et al. 1978, RVF Relative fee value*

## Grass management in practice

Producing good quality grass silage must take into account several challenges, including palatability, fiber digestibility, passage rate and harvest time. Timing is crucial. The quality of spring grass is higher than alfalfa in terms of NDF digestibility, but declines more rapidly over time. Summer and fall cuttings, in contrast, mature more slowly. Generally, if the harvest time is delayed by a week or more, grasses will be penalized with higher fiber content. If previous experience suggests high fiber content could be an issue on your farm, one option could be to plant a late maturing variety of grass and try to harvest it faster. Caution is warranted: reduced intake is associated with too late harvests.

## Butyric acid

Forage contaminated with butyric acid should be avoided for pre- and post-fresh cows, which have zero tolerance for this chemical. Their bodies, convert butyric acid from the silage into hydroxybutyric acid, a ketone body. When ensilaged, high moisture plants collected with soil contamination at high moisture content can lead to clostridia fermentation resulting in high butyric acid and ammonia content and protein reduction, compromising palatability. When butyric acid appears in silage, with time the situation only get worse: the amount of acid increases steadily, further reducing silage quality. The *Clostridia* responsible for butiric acid fermentation are present in soil and cannot tolerate acidic conditions. *L. plantarum* is the strongest lactic acid producing bacteria strain known, and it is included in the composition of Biomin® Biostabil Plus, an innovative silage inoculant for grass, alfalfa and haylage proven to EFSA requirements to effectively reduce butyric acid content in grass silage. Proper silage management, wilting and the use of a proven inoculant is a sound solution to counteract butyric acid.

***Table 4***. Mycotoxin forming fungi that affect silage.

| Fungi | Mycotoxins |
|---|---|
| *Peniciliium roquefortii* | roquefortine C<br>patulin<br>mycophenolic acid |
| *Aspergillus fumigatus* | gliotoxin<br>other ergot alkaloid types |
| *Monascus ruber* | citrinin |

*Source: BIOMIN*

## Mycotoxins

In any feed, the potential for mycotoxin contamination is real. In the case of grass silage, the risk is different from other feeds or even corn silage. Some mycotoxins occur before the ensiling process. For perennial ryegrass or tall fescues this can include ergot alkaloids from wild type endophytic fungi growing within the grass. In the case of corn silage there is a generally higher risk of the trichothecenes such as deoxynivalenol T-2 toxin: their concentrations can actually increase during the ensiling process.

More mycotoxins can be formed during and after ensiling depending on contamination by undesirable fungi. The common mycotoxin forming fungi affecting silage are those able to cope with low oxygen conditions (*Table 4*). A wide range of other fungi can cause issues if initial moisture content is too high, packing is poor or parts of the silage are exposed to air.

As well as a good silage inoculant to reduce the risk of mycotoxin formation, it makes sense to include Mycofix® in the diet. Mycofix® is the only EU authorized mycotoxin counteracting product proven to address a wide range of mycotoxins and to support the liver and immune system in the face of mycotoxin challenges.

Cut & Keep Checklist

# What's Wrong with My Herd? Part 1: Breeding Difficulties

Getting cows bred is important for lifetime milk production by increasing the number of days in early and peak production. As milk production has increased, the period between calving and successful breeding has lengthened. A longer calving interval puts additional pressure on managers to get cows bred and address underlying issues that hamper breeding success.

A healthy reproductive tract and uterus able to support a young fetus are crucial. Health conditions and production are interrelated. Reproduction efficiency can be affected by ketosis, dystocia and retained placenta, but it is not directly associated with milk fever, displaced abomasum, and mastitis. The primary ways to influence reproduction are from an energy basis and specific uterine health.

Today's cows often cannot consume enough feed to meet their energy needs and can remain in negative energy balance for many weeks. Severe negative energy balance brings increased uterine inflammation, providing a poor chance for fertilisation and implantation. Increased circulating urea levels – a situation common among cows using skeletal muscles to provide carbon for glucose production – reduces reproduction efficiency. Diet energy density and total dry matter intake can lower the energy deficit duration. Reducing the drop in dry matter intake around parturition has the greatest positive effect on subsequent feed intake and energy balance. Cows in negative energy balance have also reduced immunity responses and may have more difficulty in preventing metritis.

Normally uterus involution occurs within the first 40 days postpartum. However, failure to properly expel the foetal membranes and remaining fluids sets up conditions for microbial growth and subsequent infection. Most cows will have cleaned up five weeks postpartum; however a study showed that 40% of cows have evidence of uterine disease and another 20% have subclinical endometritis.

The first steps to maximize reproductive efficiency that need to be confirmed are a good heat detection and breeding system. Then, ensure cows have the best potential for breeding heats at the appropriate time. Maximizing caloric intake by increasing caloric density of the diet through manipulation of fat and grain sources is one option. A second is maximizing dry matter intake and forage fiber digestion and usage, including the use of yeast products.

Linked to, but beyond energy intake, is the need for cows to perform as efficiently as possible, including absorption of nutrients from the gut, and an effective liver that can package and distribute nutrients needed by tissues.

The liver is critical for glucose production and redistribution of fat for use by other tissues, particularly in early lactation when both are in high demand. The liver is the first organ (after the gut itself) exposed to nutrients and other compounds absorbed and transported to the blood. Toxins that decrease liver function negatively affect a cow's energy balance.

Key phytogenic products have been demonstrated to improve liver health, support proper immune function and increase dry matter intake.

Mycotoxins in the feed can reduce feed intake, impair immune function and disrupt reproductive efficiency. Products that reduce the effects of mycotoxins are likely to assist in improving reproductive efficiency. In addition to proper management and the supply of balanced rations, producers can use selected additives to prevent or reduce problems associated with breeding difficulties.

| Check list | Potential causes |
|---|---|
| **Uterine infections** | |
| • Poor immune function | Toxin issues including:<br>• Potential nitrate poisoning, alkaloids (plant origins)<br>• Mycotoxins including aflatoxins, deoxynivalenol, T-2 toxin, ochratoxin A<br>• Other immune demands, general infections |
| • Poor uterine involution | Decreased liver function:<br>• Fatty liver syndrome, decreased nutrients provided<br>• Mycotoxins affecting the liver (aflatoxins, deoxynivalenol, T-2 toxin)<br>Mycotoxins' direct effect on the uterus: zearalenone causes oestrogenic effects and may result in uterine infections and vaginitis |
| **Energy balance** | |
| Liver function | Decreased liver efficiency due to mycotoxicosis including aflatoxins, deoxynivalenol, T-2 toxin, ochratoxin A |
| Decreased feed intake | Poor feed consumption just prior to and just after calving (pre-fresh feeding program)<br>Toxins from plants, moulds and fungi (mycotoxins)<br>Formulation including palatability, digestibility and nutrient density |

*References are available on request*

For more information, visit **www.mycotoxins.info**

DISCLAIMER: This table contains general advice on matters which most commonly affect ruminants and may be related to the presence of mycotoxins in feed. Ruminants diseases and problems include, but are not confined to the ones present in the table. BIOMIN accepts no responsibility or liability whatsoever arising from or in any way connected with the use of this table or its content. Before acting on the basis of the contents of this table, advice should be obtained directly from your veterinarian.