journal of the South African Mushroom Farmers Association

The SPAWN RUN

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December 2016

FROM THE EDITOR

As 2016 draws to a close I have a distinct impression that I shall not be alone in celebrating its end. It seems to have been a year of significance in many an individual's personal life as well as the global community, and the multitude of memes doing the rounds depicting "me at the beginning of 2016 versus me at the end of 2016" is testament to the toll people feel the year has taken.

While the festive season does little to change one's specific situation, it can just raise spirits and inspire hope for the year to come and my wish is that each of our readers experiences this in the following weeks.

This issue represents my final contribution as editor of The Spawn Run. I would like at this time to express my thanks and appreciation to SAMFA and The Spawn Run editorial committee for granting me the opportunity to facilitate the editing of the publication for the past 5 years. My involvement has presented me with a better understanding of our small, but significant industry, and the impact it can have on the broader community.

I wish those involved, as well as my successor all the best going forward.

On behalf of The Spawn Run and SAMFA I would like to thank all our readers and contributors for their efforts throughout the year and wish everyone a happy, peaceful and safe Christmas and New Year.

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The SPAWN RUN

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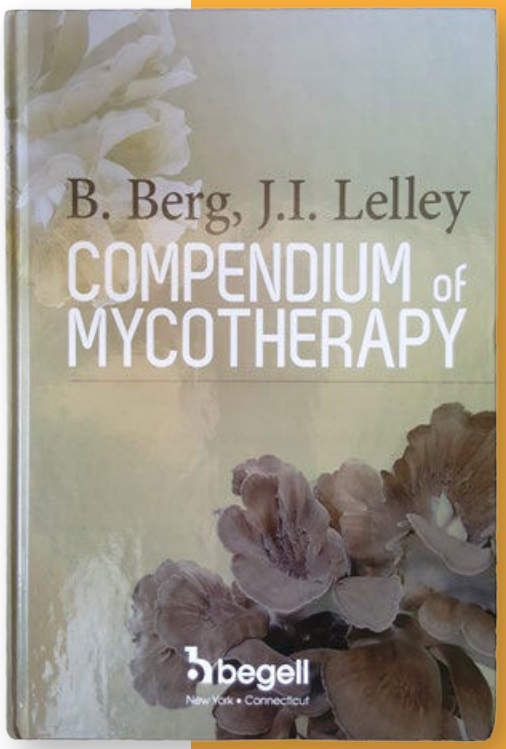
Compendium of Mycotherapy

Application of Medicinal Mushrooms for Prevention and Therapy

by B. Berg and J. I. Lelley
ISBN: 978-1-56700-451-9



The Compendium of Mycotherapy describes the 12 most important medicinal mushrooms used for mycotherapy, providing significant ingredients, application examples, and suggestions for the therapy of over 100 ailments.

The benefits of mushrooms were known in ancient times—even the Ice-Man Ötzi used them—and traditional Chinese medicine has used the now nearly forgotten healing powers of fungi since time immemorial.

Nowadays there are many research projects in progress that prove scientifically what naturopathy recognized long ago. The abundance of information is partly unclear and, (not only) for the layman, often unintelligible. Therefore, the authors introduce in this book a selection of the 12 most important medicinal mushrooms and demonstrate comprehensibly how can they used for prevention and therapy.

In additional to the well-known species like reishi, royal sun agaricus, and those of the genus Cordyceps, other popular edible mushrooms are described—for example, the button mushroom, shiitake, ink cap, and oyster mushroom. On the basis of their ingredients, all these can provide a significant contribution to our health.

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www.begellhouse.com
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IMPORTANT DATES

on the Mushroom Calendar

2017
20 - 25 March

Masterclass Mushroom Growing & Composting
20th – 25th March 2017
Mushroom Office,
Horst, The Netherlands

www.mushroomoffice.com

2017
21 - 23 June

24th North American Mushroom Conference
21st – 23rd June 2017
Fairmont hotel,
Le Chateau Frontenac,
Quebec City, Canada

www.mushroomconference.org

2017
28 May - 03 June

4th International Symposium on Post Harvest Pathology
28th May – 3rd June 2017
Skukuza, Kruger National Park, South Africa

lise.korsten@up.ac.za

2017
24 - 28 September

9th International Medicinal Mushrooms Conference
24th -28th September 2017
Palermo, Italy

www.immc9.com

2018

The 9th International Conference on Mushroom Biology and Mushroom Products
Shanghai, China

To ensure that your event is included in The Spawn Run's Mushroom Calendar, please email all the pertinent details to nathan@highveldmushrooms.co.za

Further trials conducted with MABU and European Peat in Holland

Dr Linda Meyer, MABU Casing Soils (Pty) Ltd

In June 2016 a couple of big-bags filled with Mabu's heavy pith casing soil were shipped to BVB Euroveen's Grübbenvorst facility in the south of the Netherlands to be scrutinised by BVB's mushroom casing soil technologists and researchers. They analysed the properties of the MABU casing soil; followed with formulating 5 different MABU-BVB blends. These blends were further screened in a watering test, product characteristics were measured and small and large scale growing trials were done.

Moisture content and water holding capacity (WHC) are some of the most important features of a casing soil. The moisture level and WHC were determined in BVB's watering lab (Table 1).

Table 1	Moisture content	Dry matter content	Organic matter content	Ash/mineral content	pH	EC
MABU	66.10%	33.90%	50.40%	49.60%	7.5	1.18
BVB	84.90%	15.10%	74.40%	25.60%	7.3	0.58

MABU tested much lower in moisture content than BVB. The main reason for the lower moisture level of MABU is its high ash/mineral content. Organic matter is the part of dry matter that actually holds water. The high EC is also due to the ash/mineral content.

The blends were pre-wetted to acceptable moisture levels and then watered every 2 hours until saturation.

Results indicated that 100% MABU could hold roughly twice its weight in water, where the BVB peat mix tested can hold more than double that.

For mushroom production, the moisture level itself is extremely important, but moisture level should always be seen in relation to the blend's texture.

Dutch growers find it very important that casing contains enough fibres. The fibres are important for the water retention, but also create open surface texture. After watering, the surface of a casing soil should remain open so exchange of CO_2 and O_2 can continue. If the surface erodes too strongly, it will affect the exchange and therefore the mycelium growth. In general, Dutch casing soil has a courser texture compared to any other casing in the world.

The textures of the formulated blends have been judged prior to and after watering. The results are illustrated on a scale from 1 to 5 (1 = none; 5 = strong):

Table 2 BLEND	TEXTURE Pre-Wetted	TEXTURE After Watering	EROSION After Watering
1 MABU	3.0	3.8	1.0
2	2.0	4.0	1.0
3	4.0	4.1	1.4
4	4.5	4.5	1.4
5 BVB	4.7	4.3	2.3

BVB's researchers considered MABU casing soil's texture as "quite good", and no erosion or panning was detected after repeated watering on the 100% MABU. In this instance, the more MABU added to a blend the less erosion/panning was visible. The different blends were also sieved to check the fractions. The results underlined the positive contribution of fibres to a higher WHC.

Both substrates tested clean from fungal pathogens, human bacterial pathogens and nematodes.

In a very interesting small-scale laboratory growing test, large petri-dishes (20cm diameter) were filled with a layer of phase III compost from Walkro Holland and a layer of casing soil of each

blend. The mycelium developed the fastest in 100% MABU and most likely due to the lower moisture level thereof. No significant differences between other blends were noticed and mycelium quality and stranding were consistent among all five blends.

100% BVB **50:50** **100% MABU**

The laboratory tests were followed by a large-scale growing test that was conducted at Champignonkwekerij H van Roij in Weert (Limburg). This farm averages 35 kg/m^2 in three flushes on phase III compost with the addition of 1.4 kg/m^3 Champfood supplement.

Table 3 BLEND	TOTAL YIELD (kg/m^2)	SIZE: BABY	SIZE: SMALL	SIZE: MEDIUM	SIZE: GIANT	Secondary Grade
1 MABU	37.1	16%	59%	10%	7%	8%
2	36.1	10%	55%	14%	12%	9%
3	34.6	16%	54%	10%	8%	11%
4	30.4	4%	58%	18%	10%	10%
5 BVB	34.0	3%	58%	20%	13%	6%

The BVB researcher and grower commented that blend 1 and 2 tend to pin easily and rapidly. These casings felt dryer throughout the trial. During aeration blends 1, 2 and 3 were covered by perforated plastic foil to prevent the surface from drying out. Some additional water was also given to these blends a couple of days before first flush. Although this farm caters for the small to medium size market, even for them the share of small mushrooms was high.

Blends 3, 4 and 5 showed good staggering during pinning and the blends with a higher % BVB suited the harvesting of medium-sized and giant mushrooms. The 50:50 MABU/BVB blend yielded 34.6 kg/m^2 and showed potential to deliver a good spread of small and medium to giant sized mushrooms without too much extra attention and only slight changes to the watering regime.

Following the trials, BVB developed a special mix to support a 50:50 MABU/BVB blend. Growing trials on this blend will be conducted in Holland and South Africa beginning in January 2017.

Mabu would like to express their sincere appreciation to Mathieu Geerts for his unrelenting effort, enthusiasm and loads of information, Jos Amsing for thorough laboratory testing and Henk Van Roij for risking a strange substrate from Africa on his farm and then managing to harvest fabulous yields on the MABU and MABU-BVB blends.

AERATED COMPOSTING

- a Silent Practical Breakthrough

Johan Janssen

This paper was presented at the 19th ISMS Congress in Amsterdam and is reprinted with the kind permission of the International Society for Mushroom Science and the author Johan Janssen.

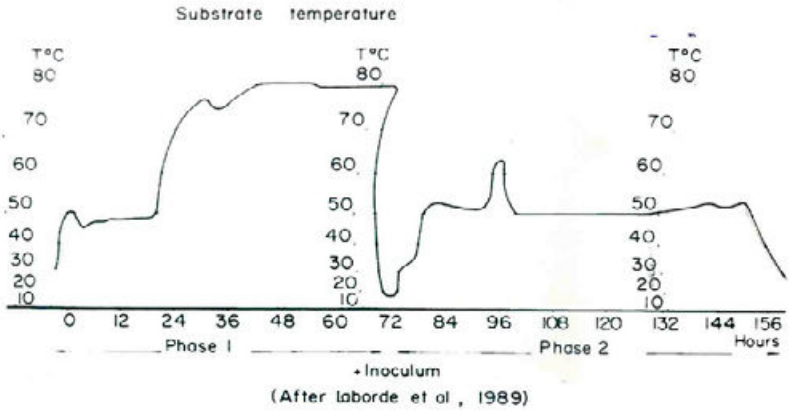
1. Introduction

The great inspirers of the research into aerated composting in Europe were Mr Jean Laborde and Mr Alex Oversteyns.

The first modern system of aerated composting was implemented at Kuhn, Full in Switzerland (Indoor Static Composting) in February 1987 and is still in operation today.

The main technical breakthrough however, occurred at Tolson's, Australia in 1992 with a new type of bunker including a spigot floor and in Europe at Walkro, Belgium in October 1993 with an open aerated spigot floor with a traverse conveyor belt above. In April 1995 C.N.C at Moerdijk, The Netherlands, began to use a unique phase I system in tunnels and an industrial pre-wetting set up.

Since then, mainly concrete bunkers with spigot floors and an on/off aeration system have been built, and filled with bunker fillers or overhead conveyor systems to allow for the layered filling of the compost.



(After laborde et al , 1989)

Mr Laborde was in favour of high temperature composting with only a few days of aerobic pre-wetting at 45°C in order to create a firm biomass. This was done specifically for straw composts and not for horse manure.

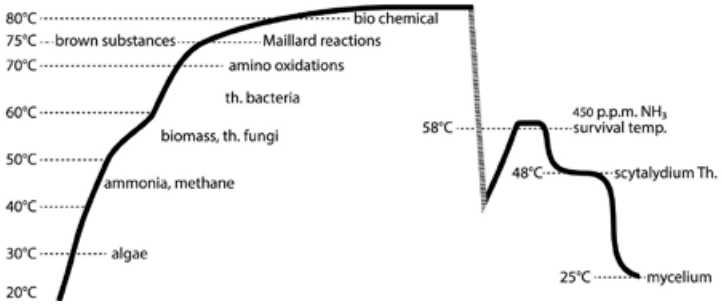
At this point in time, aerated composting was the standard solution for producing a more a stable phase I compost on a smaller area, with less odour problems. In general, compost has not changed much in the last 50 years, but the structure thereof has improved through the production of more homogeneous, less greasy and less over-fermented composts. This is important for better results at peak-heating in tunnels and consequently for incubation and cropping.

2. Temperature sequence

For a consistently high yielding substrate a high temperature phase I seems to be required and the thermal destruction of microbial populations is an essential part of the succession process.

The nitrogenous complex of brown substances forms a protective coating around the remaining carbohydrates, like cellulose and hemi-cellulose. This limits their utilization by competitor moulds. The enzymes of *Agaricus bisporus* mycelium have the capacity to degrade such a coating and create access to the underlying nutrients by the production of hydrogen peroxide and oxalic acid.

Table I



- < 50° C : At the first stage of heating, ammonia plays an important role in destroying the waxy layer of the straw, thus starting the process of "opening" the straw up. Adding urea or sulfate of ammonia in the early stages does accelerate this process. Ammonia softens the straw chemically, making organic matter available for the conversion of nitrogen into other more complex forms.

  At the start there is a lot of free water in the matrix and this can give rise to a more anaerobic process in which methanogenic bacteria and the production of methane can cause odour. This can be reduced by several flips and by adding not too much water at the start. As the material heats up the demand for oxygen increases rapidly.

- Between 50° and 60° C: Thermophilic biomass composed of fungi, bacteria and yeasts increases rapidly and converts easily degradable carbohydrates into sugars, proteins, CO2, ammonia and amino-acids. At this stage it is very important to build up a sufficient biomass. A gradual increase in temperature during this process could prove beneficial

- Microbial activity at compost temperatures below 65° C certainly breaks down organic material more aggressively and this reduces the available excess of nutrition, but can also have a negative effect on the structure of the compost in that it will become too soft.

  At temperatures over 65° C the heating process is conducted mainly by thermophilic bacteria and much less oxygen is required.

Typical brown substances are formed between 70° and 80° C in the presence of ammonia.

The change in darkening of the straw is important for the nutrient availability for A. bisporus as well as better selectivity.

- Between 70° and 75° C: Biological processes take place which include the creation of polyphenols by thermophylic fungi while using up soluble sugars and starch, the formation of brown substances through the degradation of lignin by enzymatic reactions and amino oxidations. These reactions integrate nitrogen and protect it.
- 75° to 80° C: At such high temperatures further formation of brown protective substances by bio-chemical activity (Maillard-reactions) takes place. Production of melanoidins from sugars and amino-acids gives compost its unique caramel smell.

3. Optimal figures.

Apart from visual inspection of compost at the moment of spawning, regular reliable chemical analyses of the compost is needed. Herewith some general average figures:

- pH-value: 7.3, which is lower in case of the usage of sulfate of ammonia in phase I. The aim would be a pH 6.2 after 15 days incubation.
- NH_4 or ammonium content: 0.02 %. High pH combined with high NH_4 is negative.
- Moisture content: 68 %, but always related to the structure. In general water is never added at spawning, but rather at filling phase I compost in tunnels. The optimal moisture for phase III would be around 63 %.
- Nitrogen content: 2.1 % for horse manure composts and 2.2 % for straw composts based on dry weight.
- Ash content: about 25 % in order to have sufficient organic material and not too much pollution by silicates, sand or other non producing minerals.
- C/N-ratio: 17/1 based on dry weight with which there is empirically the best yields.

Besides figures, the structure of the compost is very important for optimal yielding capacity. It is hard to bring structure into figures, as it is with colour and smell.

There are some quality monitoring procedures in use to give a figure at certain stages of the preparation of compost for colour, structure and smell.

Compost can be too homogeneous. In the past in the traditional rick system, mixing and more mixing was necessary to create more homogeneity and many times the result was poor. Nowadays with the modern mixing stations in combination with aerated composting in bunkers, too much homogeneity can be created and may result in soft, sticky compost.

I am of the opinion that some parts of less degraded straw can create a framework and give more volume of the phase III compost. This will result in more activity and a bigger temperature difference between compost and air during growing, as well as a better temperature increase at the end of the first flush. Even if these less fermented straw parts do not contribute to the direct nutrition of the mushroom, there is a strong general opinion that over fermentation is much more negative than under composting.

Gypsum is a very important ingredient of the compost - without gypsum, no mushrooms.

Gypsum can be from a natural source or a byproduct of a clean industrial process. It reduces the pH at phase I and II and neutralizes the oxalic acid formed by the *Agaricus* mycelium at incubation and later during cropping.

Only Ca $SO_4 2H_2O$ (dihydrate) is suited while Ca $SO_4 H2O$ (anhydrite) is not. Calcium carbonate ($CaCO_3$) can just be used in combination with sulfate of ammonia by which chemically gypsum will be formed.

4. Practical.

Temperature increase seems by far the most important aspect in aerated composting. After filling the bunker at day 0, the temperature should reach 80°C in about 12 hours. Therefore also during pre-wet, outside or in a bunker, the last day before filling the bunker, the temperature should be at least 75°C. This is to ensure a good start of phase I at day 0, i.e. one week before filling the tunnel.

The process of fermentation is basically a **balance** between absorbing water and increasing temperatures. The first watering of the straw should not create anaerobic conditions, but an increase in temperature. This increase, under ammoniacal conditions, softens the straw. The de-waxing leads to better absorption and makes other carbohydrates free for heating activity. This creates brown substances by so called Maillard-reactions which cause more softening and breakdown of carbohydrates for activity. By watering at high temperatures the chemical reactions that take place at 80°C create a chemical burning effect, whilst preserving structure and thus prevents the production of dark greasy compost. Measuring the oxygen content in the compost regularly fails in practice, but it can be used to find the optimum timer settings in order to obtain the temperature increase towards 80° C. The ideal temperature increase is always a sign for optimal aeration.

Below is a general insight of different optimal oxygen levels:

	Part one Start till 65°C	Part two 65oC till 75°C.	Part three 75°C and above
Oxygen in compost	10%	Min. oxygen 9%	Min. oxygen 8%
Need for fresh-air	10 m^3 /ton/hour	7-8 m^3 /ton/hour	3-4 m^3 /ton/hour
Possible setting	20 min on 10 min off	15 min on 15 min off	4 min on 26 min off

Calculating fan capacity for 300 tons: 300 x 8 = 2400 m^3/hour multiplied by 2 = 4800 m^3/hour for 15 minutes on and 15 minutes off at an air pressure of at least 3000 Pascal. For 30 tons it is 10% of this fan capacity.

In closed bunkers it is important to ventilate above the compost in order to reduce the temperature to below 50°C to ensure the survival of *Scytalidium spp*.

After emptying the bunker it is wise to leave the compost outside for 12 hours before filling the tunnel in order to regenerate the micro flora.

When problem composts that are not clear of ammonia by the end of the phase II process arise, mixing about 2% phase II compost at the filling of the tunnel with phase I compost as bio-inoculum may help to remedy the situation going forward.

An ongoing discussion is also what to do when the compost is free of ammonia at the end of conditioning: should conditioning temperatures be maintained until spawning or is it better to cool down to 28°C. In my opinion it is best to cool down and not break down more carbohydrates than necessary.

The goal is to produce a black and non greasy type of compost week in and week out, which can be finished well at peak heating. The ammonia (NH_3) reading at the end of pasteurization, plays a more important role in this than the nitrogen content. The aim would be to get an ammonia level of 400 - 500 ppm at the end of pasteurization in order to create selectivity against weed moulds.

By adding more or less ammonia, either in the form of ± 10 kg of poultry manure, 1 kg of sulfate of ammonia or 40 litres of goody water per ton of compost, the ammonia level can be altered. This can be added at the end of fermentation or filling the tunnel.

Conclusion

Through conflicting discussions between rival camps of scientists in the eighties until early 1992 regarding low versus high temperature fermentation, aerobic fermentation was experimented with. As a result different practical compost makers proved conclusively the supremacy of high temperature aerobic fermentation by the use of bunkers with spigot floors. Since Mr Jean Laborde put the puzzle together, composting has become less scientific. With a good pre-wet, intensive mixing of the ingredients and the mechanical shredding of straw, this system can successfully be used in large and small operations all over the world.

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REPORT BACK:

2016 Power Of Pink Campaign

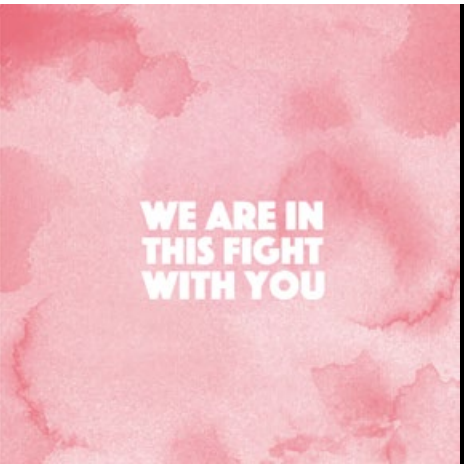
by Riana Greenblo, Riana Greenblo Communications

HEADLINES:

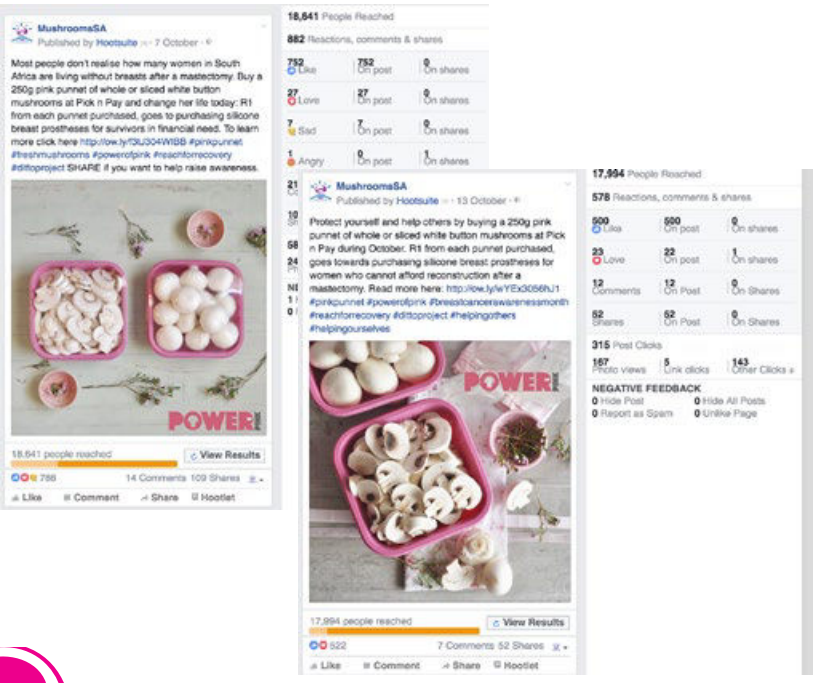
- 2016 pink punnet sales show an increase of 14.7% over 2015 despite some delivery issues.
- Return on Investment 2016 1:9 (for every R1 invested in the campaign a return of R9 was generated).
- Coverage increased from R571132.37 in 2015 to R1634274.13 in 2016
- For the first time the campaign had two ambassadors, Razia Samson and Lisa Raleigh, who were exceptionally active and made a huge contribution to additional media coverage and consumer awareness.
- 535 women received silicone prostheses during 2016. The prostheses were purchased at R748.00 per unit using the proceeds from the 2015 campaign.

FACEBOOK CAMPAIGN

The Facebook campaign took on a very human face, showing support, the benefit of the fund-raising and a strong call to action

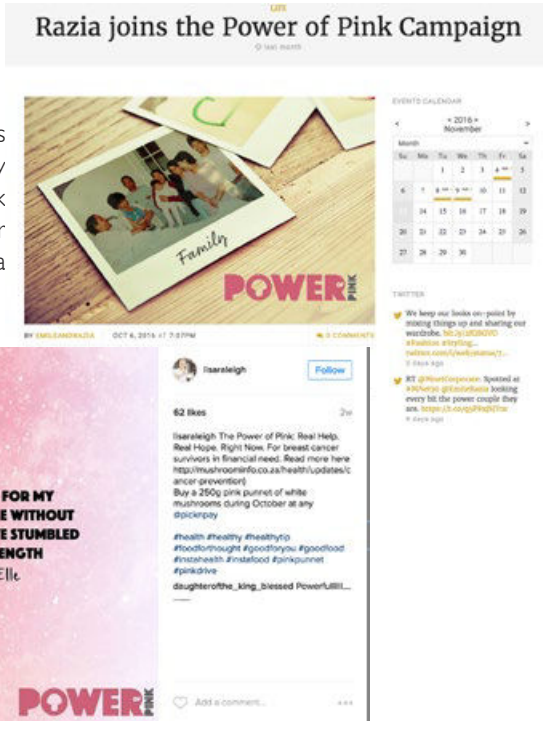


Great participation from our Facebook fans:



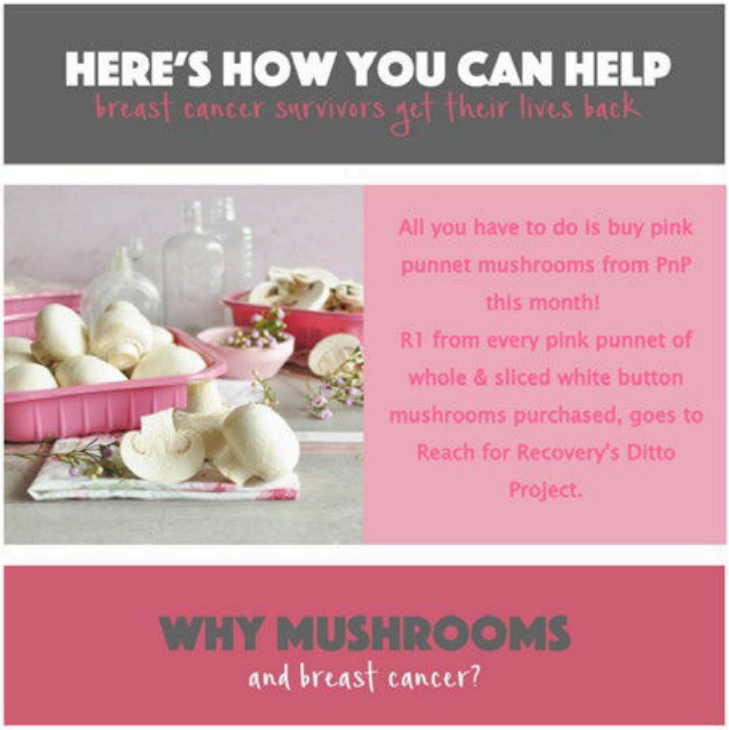
2016 AMBASSADOR PARTICIPATION

Our ambassadors created great visibility for the Power of Pink campaign on their own social media platforms



NEWSLETTER TO SUBSCRIBERS AND DIETICIANS

A newsletter was sent to all our subscribers and to our dietitians to encourage them to participate in the Power of Pink campaign and to tell them more about the cancer fighting properties of mushrooms

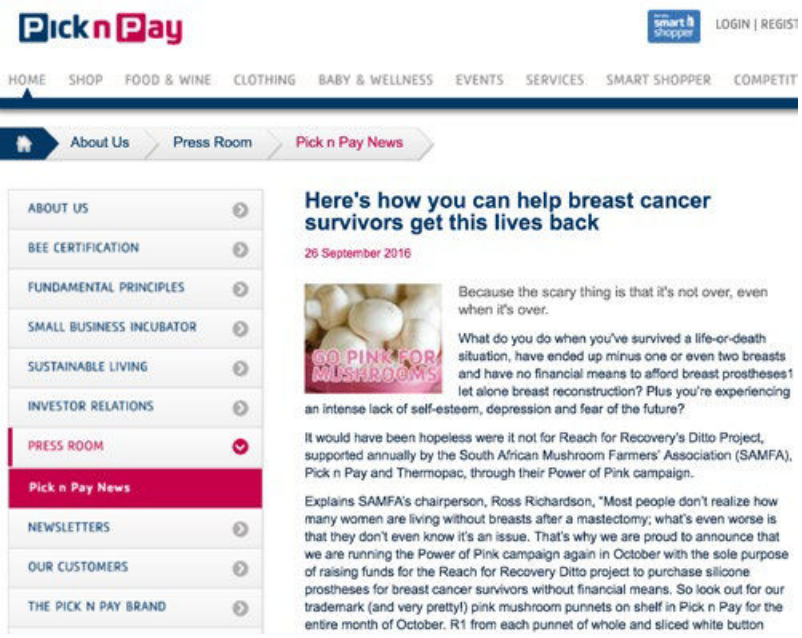


IN-STORE

The campaign ran in Pick n Pay stores nationally for the month of October. Point of sale included the on-punnet sticker as well as a wobbler. Incorporated into the wobbler was a QR code which consumers could download for more information on the campaign and the cancer fighting properties of mushrooms.

PICK N PAY'S CONTRIBUTION TO CAMPAIGN VISIBILITY

Pick n Pay was an exceptional partner this year. They not only ran a Power of Pink in-store radio campaign for the full month (with an ad running every hour), their on-line dietician wrote about the health benefits of mushrooms and featured our "pink" recipes, whilst their social media team generously posted our campaign material on their Facebook and Twitter pages during October.



THE BENEFITS OF THE POWER OF PINK CAMPAIGN

SAMFA supports Reach for Recovery's Ditto Project to assist in providing breast cancer survivors in financial need with silicone breast prostheses. The Power of Pink campaign assisted 535 women during 2016 and funds raised through the campaign now cover 66% of the costs to provide breast cancer patients with this wonderful opportunity to feel confident and dignified again after a mastectomy!

Anna's story:

Anna had her mastectomy in 1985 and because of lack of money, she fashioned a breast form for herself with birdseeds. After making contact with Reach for Recovery, she received a silicone prosthesis. Anna could not believe the softness, the comfort and the perfect fitting! As a Reach for Recovery volunteer, I still get goosebumps when recalling how thankful and happy she was.

20 QUESTIONS

with John Heritage

Production Director, Highveld Mushrooms

How did you get into Mushrooms?
Actually by default, I joined HVM as a Millwright in the maintenance department and after a few months I was asked to assist in running the compost yard when the compost maker resigned.

How many years have you been in Mushrooms?
A total of sixteen years…..fourteen at Highveld Mushrooms and two at Sylvan Africa.

What is most difficult task you have had to undertake while in Mushrooms?
To manage and facilitate the transition from rick compost to bunker compost without any major production losses.

What is your greatest strength/talent?
My management and leadership skills and the ability to do strategic planning when necessary.

What is your favourite pastime?
To surf the net looking at Game farms for sale in the Waterberg district and tending to my Cycad collection.

If you could change one personality/character trait you have, what would it be?
To stress less and relax more.

As a student, what did you want to do or be after your schooling?
Actually I was very interested in becoming a professional soldier.

What was the most significant event in your whole career so far?
To be entrusted with the position of Production Director at Highveld Mushrooms.

What do you feel is your greatest achievement in life?
To be able to marry my high school sweetheart and celebrate our 25th year of marriage this year.

If budget was unlimited what car would you drive?
Top of the range Toyota land Cruiser.

Who has had the greatest influence in your life and why?
Excluding my faith, no one person has had the honour of occupying that space because I truly believe that in your life's journey different people will influence you, be it for a day, season or life time.

What is the craziest thing you have ever done?
I once owned a Suzuki GSXR 1000... that should answer your question.

What are you addicted to?
Cycads and cycad auctions.

Do you have a nickname and if so what is it and why?
No I don't... I'm the lucky one at Highveld Mushrooms.

What is your favourite movie?
Anything with Tommy Lee Jones or Denzel Washington.

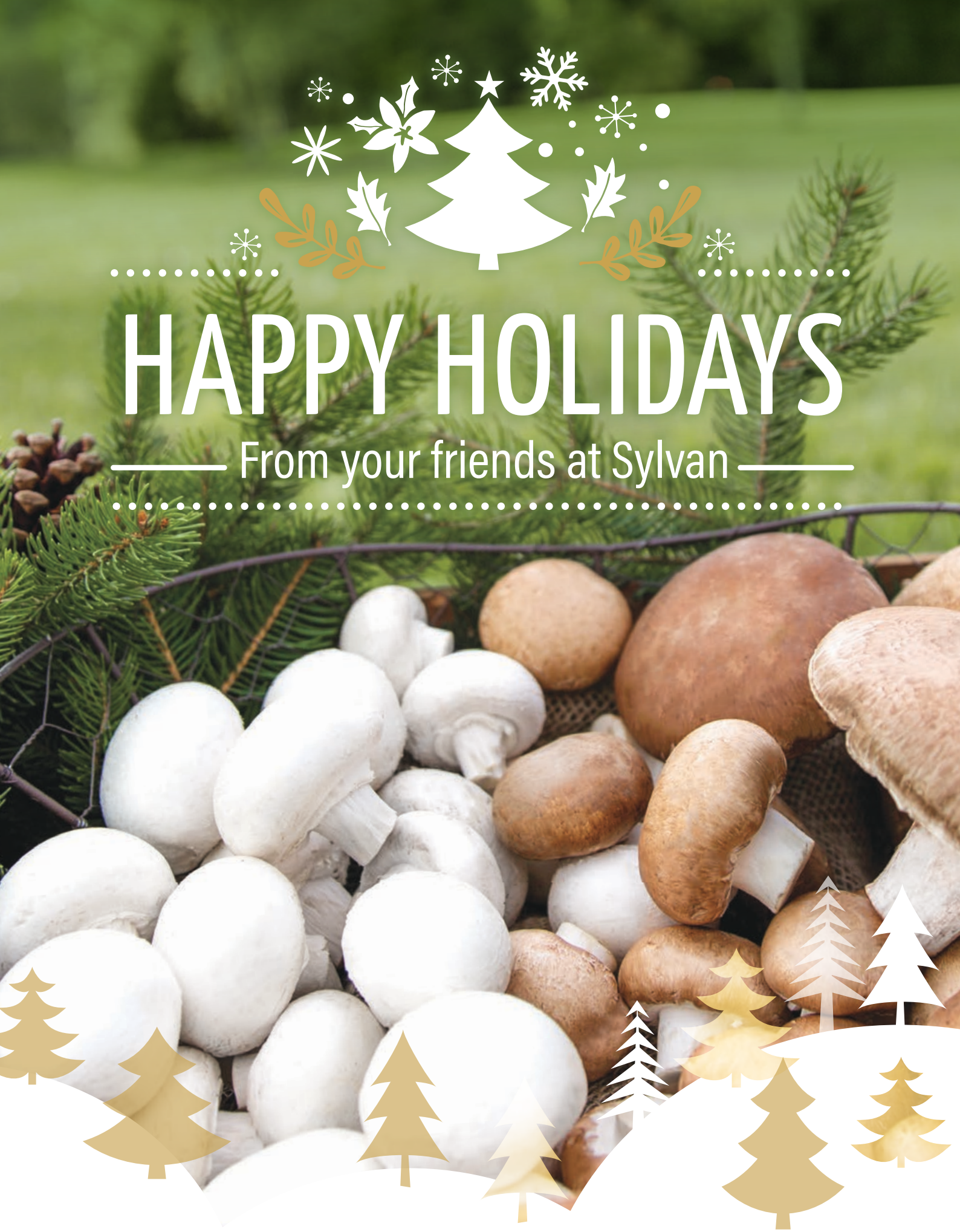
What cheers you up?
To be in the bushveld on top of a "Koppie" overlooking the valley.

If you could be, or were to describe yourself as an animal, what animal would it be and why?
A Cape buffalo... it is cool, calm and collected as long as you don't mess with it.

What is your greatest fear?
To lose the passion to chase my dreams in life.

What is your favourite meal?
Steak and chips.

What is the best life advice you have been given?
It was from my Dad... to purchase my own property as soon as I could afford it, so I bought my first house at the age of 24 for R96000 and have never regretted it.



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CULTIVATING EXCELLENCE

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