

A review of publications & communications related to biochar and golf courses

Compiled by John Hofmyer, Mar 2019

1. Research intensity increases

As biochar technology and its applications mature, so more and more academic work is being performed. Below is a listing of the number of "hits" found by Google Scholar on 14 March 2019.

Caveat:

The values below should be taken only as indicative. Two of the reasons are as follows:

- The procedure finds words within the search string if they appear anywhere on the web page (in a list of "related titles" as a side-bar to the main item, for example) and not necessarily within the subject publication itself.
- It finds such words even if they may only appear in the references at the end of a publication. Hence the publication itself may not refer to biochar at all.

Search string: biochar golf course			Search string: biochar golf		
Since date	No of hits	Average Publications per month	Since date	No of hits	Average Publications per month
All time	512	N/A	All time	612	N/A
2005	458	2.7	2005	545	3.2
2010	415	3.8	2010	492	4.4
2015	257	5.1	2015	304	6.0
2018	100	6.8	2018	116	7.9
2019.01	15	6.0	2019.01	22	8.8

A superficial reading of the Google Scholar information suggests that the application of biochar to golf courses seems to be mostly on areas other than the putting greens. A possible reason for this is the approach used by the USGA which is respected also in countries other than the USA. The Association's guidelines for construction of greens include the following: *"Other amendments such as humates, biochar, seaweed products, vermiculture byproducts are sometimes used to amend rootzone mixtures. While some may view these products as adding value, they are not a replacement for peat or porous inorganic amendments."*^[1]

This suggests that there is some confusion about the terminology. Biochar is a '*porous inorganic amendment*'; its physical, chemical and biological behaviour is patently different from those of humates, seaweed products, vermiculture byproducts and similar biodegradable products. This confusion is also indicated in South Africa: There seem to be worries about accumulation of excessive thatch^[2] on putting surfaces hence a resistance to the application of organic matter such as compost or vermicompost. This argument was adduced by a course-consultant as a reason for not applying biochar to putting greens. It suggests a grave lack of understanding about the nature of biochar.

The situation seems to be different in the UK. Soil amendments which contain biochar are used by at least two Scottish courses on their greens.

¹ <http://archive.lib.msu.edu/tic/usgamisc/monos/2018recommendationsmethodputtinggreen.pdf>

² Dead turfgrass roots and other organic residue which accumulates between the soil surface and the green vegetation.

2. A few recent references:

These vignettes are reported from a few phone calls and a quick review of 2019 "hits" using Google Scholar. They represent a small slice of the available information.

<https://www.soilfixer.co.uk/Biochar-for-golf-greens-and-lawns>

Excerpt: "Problem

How to get the biochar down to the root zone. Some green keepers have tried to brush it into the aeration drill holes made as a normal part of the early season preparation work."^[3]

One tonne was supplied to a golf course in Scotland which was applied to one or two greens. Assuming average green size of 350m², that suggests an application rate of approx 15 or 30t/ha, depending on whether one or two greens were treated. No data on turf response was forthcoming.

<https://www.carbongold.com/okehampton-golf-club-case-study/>

CarbonGold reports Okehampton Golf Course reduces fertilizer application by 20% and fungicide application by 100% using enriched biochar. Unlike the reference above, the biochar was simply brushed onto the surface of the trial greens (holes 5 and 12).

Excerpt:

"The trial greens were more resilient over the course of the year – whatever the seasons threw at them – during the hot dry periods they held onto the moisture better and were visibly healthier. In wetter periods they did not flood, were firmer, dryer and remained playable. This is a great advantage for the club during the wet months – if there is too much rain the course can flood and the greens become un-playable, which leads to closure and loss of revenue. With the use of Carbon Gold's enriched biochar, this can now be avoided."

[Effects of Biochar on Container Substrate Properties and Growth of Plants—A Review](#)

L Huang, M Gu - Horticulturae, 2019 - mdpi.com

Excerpt:

Caution is needed when selecting feedstocks and setting up biochar production conditions, which might cause toxic contaminants in the biochar products that could have negative effects on plant growth.

[Biochar as a microbial carrier](#)

RW Belcher, HS Kim, B Buege... - US Patent App. 15 ..., 2019 - freepatentsonline.com

The invention relates to a microbial delivery system where biochar acts as a carrier for microbes.

... 6, 2011, titled METHOD FOR ENHANCING SOIL GROWTH USING **BIO-CHAR** (now US Pat ...

Generally, treated **biochar** of the present invention can be used throughout the world, in numerous ...

such as, soybean, corn, sugarcane and rice, in forestry applications, for **golf** courses ...

³ Presumably this is a reference to (partially?) filling the holes left by the hollow-tines with biochar and allowing the soil biota to distribute it further.

<http://golfnewsreal.club/2019/02/06/broken-sound-club-site-of-next-weeks-pga-tour-champions-event-among-winners-of-2018-environmental-leaders-of-golf-award/>

Broken Sound Golf Club. Excerpt:

"(Shannon) Easter is also a devotee of amending his golf course soil with applications of Biochar Carbon as a soil amendment to enhance and improve soil productivity. After topdressing his course with the carbon powder, Easter says, the soil holds moisture better and retains nutrients longer. He once went three weeks without having to irrigate. He uses 40% less fertilizer and 60% less fungicide on fairways and greens than in the past, and his turfgrass is healthier. During a recent renovation of the New Course by architect Matt Swanson, Easter had carbon mixed into the top 12 inches of the soil profile of tees, fairways and rough during the reconstruction to help retain nutrients for the new turf and to neutralize chemicals."^[4]

(<https://www.randpark.co.za/wp-content/uploads/2018/09/AGM-Report-FINAL.pdf>)

Rand Park GC, South Africa (2017). Excerpt:

"... organic fertilizer product has been applied to the fairways of both golf courses as a base fertilizer. This fertilizer consists of vermicasts (humus) and biochar."^[5]

⁴ A failed attempt was made to contact Shannon Easter by phone to establish application rates, origin of the biochar, its physico-chemical properties and related information.

⁵ No useful information could be established. (Mass- or volume-ratio of vermicast to biochar or the application procedure or the application rate or the turf response.)