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Biotechnology Advances: CRISPR genome editing

John Lapham

*"Very few technologies truly merit the epithet **game changer** — but a new genetic engineering tool known as CRISPR-Cas9 is one of them" - Maywa Montenegro, UC Berkley, Ensia Magazine, January 2016.*

CRISPR-Cas9 is a newly developed genetic editing tool that enables genes within an organism to be rearranged, removed or altered very precisely and easily. Since the 1970's, when it was first possible to alter the genetic material of a plant or animal, efforts to do so have required months or even years of molecular manipulation. With the introduction of CRISPR, only a couple of years ago, the speed and precision of genome editing have soared (a genome is the complete set of genes in a cell).

Although genetic engineering has in the past enabled the transfer and insertion of targeted foreign genes into organisms, it has been extremely difficult to alter or delete genes within the plant or animal. The current genetically modified crops and animals, in commercial production, are referred to as GMO's and all contain foreign DNA (strands of genes); that is, they contain genes inserted from another species. This is referred to as transgenic transfer (between two organisms that cannot reproduce with each other). The CRISPR technique enables manipulation of the genome within the plant or animal, and no foreign DNA remains in the organism; that is, there is no transgenic transfer of DNA.

The CRISPR method is increasingly being used by research labs, small companies, and public plant breeders because of the high expense and risks of conventional genetic engineering. Already, in China fungus-resistant wheat has been developed in laboratory conditions and the technique is being used to boost rice yields. In the UK, a gene in barley has been modified to improve seed germination, which could assist in drought-resistance.

There are numerous other projects in the

pipeline. A company in Brazil is working on beef cattle with larger muscles (for more meat, which could be more tender), while other firms are developing chickens that only produce female offspring (for egg-laying) and beef cattle that only produce males (for more efficient feed-to-meat conversion, compared with females). In the US, Caribou Biosciences is growing maize and wheat strains edited for drought resistance; field trials are set to begin in 2016, and varieties are to be marketed in 5 to 10 years time. Various strategies for highly efficient production of renewable energy (biofuel) are also being investigated.

Use of the technique is equally applicable in humans and consequently has great significance in medicine and health. For example, work is currently being done on the Aedes mosquitoes to prevent the spread of the Zika virus.

The vast array of potential uses of the technique means that its control and regulation are critical. Currently, it is not covered by GMO regulations in the US because legislation is based on the product; there is no foreign DNA in the organisms, so they are not classed as GMO's. However, European legislation is concerned with the procedures used in genetic manipulation rather than the product, and its use will be scrutinised. Furthermore, the technique is easy to use and cheap. The concern is that in the wrong hands, it could result in serious consequences.



John Lapham

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Tips and tools for advisors

Caring for chickens during winter cold spells

Portia Phahlane

Chickens are relatively resilient, and while tolerance of low temperatures is high, exposure to extreme weather conditions can be fatal. During winter, chickens huddle for warmth, and their housing should be warm and dry, making them more comfortable and less prone to stress and disease. When chickens are healthy, they use energy to produce meat and eggs instead of fighting disease pathogens, and Layers overcome moulting quicker - producing larger and higher quality eggs.

Caring for chickens this winter includes:

- Keeping housing well ventilated
- Providing clean bedding
- Providing daily fresh feed and water
- Cleaning the house regularly to manage disease and pest control

Getting to know the ESO Provincial Top Users

Getting to know your ESO Provincial Top Users, takes us to the Alfred Nzo District Municipality in the Eastern Cape Province this month, where Ms. Koliwe Mjali and colleagues work under the supervision of Mr. N. Kongo and district director, Mr. Qgulu. Koliwe, who hails from Qumbu, in the O. R. Tambo District Municipality, has been with the Department of Agriculture for 9 years as an Extension Officer. The municipality area is dry, but thanks to the natural vegetation, it is suitable for livestock production. Koliwe attends to the extension needs of 750 farmers in her ward, advising them mainly on livestock, but also on crop production.

Our top user was introduced to Extension Suite Online® in 2013 during a workshop and has never stopped using it since then. She says being so simple to access, ESO's value lies in the immediate availability of all the information she needs to advise clients properly. Koliwe uses the system daily, spending most of her time on animal production - goats and mohair. She frequently uses the system to prepare for workshops with her farmer clients.

Koliwe tells us that Extension Suite Online® has boosted her work-confidence, and the relationship (built on trust) with her farmers is now stronger - ESO provides her with immediate answers to their questions, and helps her to bring new ideas to their farming operations.

She concludes that ESO makes her much more efficient as the shortened time now required to gain information and offer help, allows her to serve more clients in less time.



Koliwe Mjali

National ESO Top User

Congratulations to **Jeremia Murovhi** the ESO National Top User for May 2016.

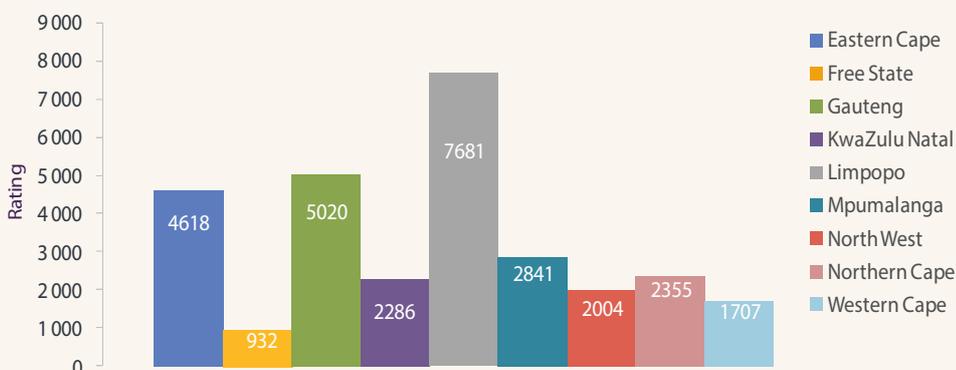
Monthly national ESO users receive the following prizes: First time National ESO User 2016: **4 Gig USB memory stick**, second time National ESO User 2016: **Digital Camera**, third time National ESO User 2016: **Nokia Lumia 520**, fourth time National ESO User 2016: **Samsung Galaxy Tab**.

EXTENSION SUITE ONLINE® UTILISATION:

May 2016

Extension Suite Online®(ESO) utilisation is determined through monitoring user utilisation in the nine provinces and by attaching values to Visits, Pages Visited and Duration of Visits; a rating is calculated to establish the ESO National Top User of the Month.

ESO PROVINCIAL TOP USER GRAPH



ESO PROVINCIAL TOP USERS

Province	Name
Eastern Cape	Koliwe Mjali
Free State	Moshodi Marumo
Gauteng	Sizwe Nzuza
KwaZulu Natal	Kokobetso Ralph Chiloane
Limpopo	Jeremia Murovhi
Mpumalanga	Lucas Shabangu
North West	Mompoti Gabanakgosi
Northern Cape	Antionelle Daniels



CLIMATE WATCH

Issue #5

Read the full article on the Manstrat AIS website.

www.manstrat.co.za - Climate Watch

May 2016 started with cold temperatures across the country due to a cold front that moved over large parts of the country. Some of the coldest temperatures for 2016 so far were recorded on the night of 1 May. A cut of low produced widespread rainfall over large parts of the country around 14-15 May, causing temperatures to remain low. The development of a ridging high caused rainfall and cold temperatures in Gauteng around 26 May. Gauteng temperatures dropped to new lows for 2016 on 28 & 31 May...

ESO TIPS:

Good Tech Habits

With life becoming more and more technology driven each day, it is not without reason that users should try to pick up good technology habits. There are several key reasons why good tech habits can make life so much easier for us. Here are a couple to start you off with:

1. Keep your computer organized – Take time to organise your files and folders, thus, making it easier to find items and to save time, such as the ESO shortcut on your desktop.

2. Use secure passwords – It is very important to use secure passwords; weak passwords may lead to you losing data or someone hacking your ESO account– or even your bank account.

3. Google it – Hear this a lot? When faced with a tech problem try and Google your problem instead of paying someone to do the fixing for you. Google is filled with loads of guides on how to fix things.

4. Back-up your files – Nobody likes losing data. Buy a flash disk and try to back-up important files at least once a week, especially those research documents you have collected from ESO over the years.

Do you have any technology related questions? Send them to newsletter@esuite.co.za, with your name, province and the question and we will answer them in a following newsletter edition.



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