

INDIGENOUS CROPS

Study sheds light on the mysteries of medicinal *Pelargonium sidoides*

*Once treasured as a traditional medicine, *Pelargonium sidoides* is now a globally recognised remedy. But what do we know about the cultivation of this wonder plant? Newly concluded research has provided much needed answers. Article by Petro Kotzé.*



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Even those unfamiliar with *Pelargonium sidoides* could likely have benefited from the plant's medicinal properties. A member of the Geraniaceae family, it flourishes in its endemic habitats in the Eastern Cape and Free State provinces, as well as in Lesotho. Commercial extracts of *P. sidoides*'s bitter roots are sold worldwide in syrups, tablets, and lozenges. Popular brands include Linctagon C and Umckaloabo.

Yet, the tufted pelargonium, with its velvety silver leaves and near-black flowers, is still not being grown on scale to the benefit of communities that first uncovered the plant's medicinal properties.

Cultivating the plant, which is often harvested from the wild, is not straightforward. Ulrich Feiter, CEO of Parceval Pharmaceuticals, which grows the plant locally for export, points out that it took years of experimentation before they were able to do so successfully on a large scale. Due to the interest and commitment of companies such as Schwabe and Parceval over the last decades, the occurrence, genetics, propagation and cultivation of *Pelargonium sidoides* is probably the best studied and understood of any medicinal plant in South Africa.

However, much of this knowledge is protected by companies that benefit from it commercially, and little is publicly known

about how irrigation, harvest timing, and water stress affect the plant's yields or medicinal qualities – knowledge that could provide an opportunity for small-scale farmers to tap into a lucrative value chain.

There could be more benefits to the successful cultivation of *P. sidoides*. It would ensure an authentic supply of the plant (that is easily confused with other species, especially *P. reniforme*). It would help conserve the species in the wild. It could be more readily used as a health supplement in rural communities and create a sustainable and legitimate supply for buyers.

Working towards these goals, a Water Research Commission (WRC) funded project (concluded earlier this year) investigated the best methods for cultivating the pelargonium. The project assessed the growth of *Pelargonium sidoides* under three different irrigation conditions and the effect of these conditions, as well as harvesting age, on the plant's root yield and chemical composition. The research team also studied how water stress affects the activity of soil microbial enzymes and soil quality.

However, as WRC's Assistant Research Manager, Dr Samkelisiwe Hlophe-Ginindza explains, the project is about more than just science. It is also about making the findings practical, accessible, and beneficial for farmers and communities. "We need to ensure the work leads to real-world impact," she says.

The project was conducted by researchers from the Cape Peninsula University of Technology (CPUT), the universities of the Western Cape and Johannesburg and the Agricultural Research Council (ARC). They grew the pelargonium in pots under tunnel conditions at the ARC facilities at Infruitec-Nietvoorbij in Stellenbosch, completing two harvests and continuing observations beyond the official reporting period, for a third harvest.

The paradox of stress: when less water means more medicine

The researchers found that the plant adopted various strategies in response to water stress. Overall, the well-watered plants exhibited superior performance across morphological, physiological, and yield parameters. However, the fresh and dried root yield of the moderately stressed plants was better than that of the well-watered plants during the second harvest.

Then, as water deficit became more intense, most of the measured plant parameters experienced a decline again. Too much soil moisture also led to root rot in some of the well-watered plants. Still, the plant is drought-tolerant, says project leader Dr Nike Lewu, a senior researcher at ARC Infruitec-Nietvoorbij, and it can be successfully cultivated commercially without the need for complex irrigation systems.

An intriguing finding resulted from chemical analysis of the plants. The phytochemical analysis of *P. sidoides* extracts revealed the presence of saponins, flavonoids, terpenoids, phenols, tannins, and coumarins across all irrigation levels and harvest ages. However, under water stress, the plants produced more secondary metabolites. "The secondary metabolites, the compounds responsible for the plant's healing effects, increase when the plant is under stress," Dr Lewu explains. Flavonoid levels were highest at moderate irrigation, while coumarins peaked under severe stress.

Dr Lewu notes that under drought conditions, the plant produces more coumarin – the compound that makes it so effective against respiratory infections. "After six months of stress, we saw an increase in secondary metabolites. After 12 months, even higher. At 18 months, they declined, but remained higher than the first harvest. We suspect that the season also plays a role, winter plants were richer than those in summer."

In short, stress doesn't just harden the plant's will to survive; it strengthens its medicinal power.

The findings highlight the importance of proper irrigation guidelines for the cultivation of *P. sidoides* and for continued funding to do so. This is especially important since the plants only mature at four to five years. "Without a full four- to five-year cycle, we cannot yet provide farmers with complete cultivation guidelines," Dr Lewu says.

Taking the findings to the farmers

The findings were presented at a workshop in Stellenbosch this September. It brought together funders, farmers and policy-makers. Dr Hlophe-Ginindza notes that the workshop created an opportunity for people to talk and ask questions, and for bonds to be formed between farmers, markets and stakeholders.

The event formed part of the execution of a broader WRC

A true wonder plant

Pelargonium sidoides is known variously as the African geranium, Umckaloabo, Uvendale (isiXhosa), Kalwerbossie (Afrikaans), iYeza lezikali (isiXhosa), Iwayiba (isiXhosa), ikhubalo (isiXhosa), Rabassam (Dutch/Afrikaans) and Khoara e nyenyane (Sesotho). "It's the true Mzansi for sure," says species expert, Prof Francis Lewu, a researcher at the Cape Peninsula University of Technology (CPUT).

The roots contain powerful antibacterial and antifungal properties. Their coumarins and flavonoids support immune responses and fight infections, especially respiratory illnesses. Its traditional uses span an impressive list, including tuberculosis, bronchitis, coughs, fevers, diarrhoea, gonorrhoea, liver disorders, infant stomach ailments, and even colic in livestock. Pelargonium is not new to the global market. Germany and other countries have long commercialised extracts such as Umckaloabo for respiratory illnesses. Yet, despite being the plant's natural home, South Africa has not built a strong local value chain to harvest the benefits the plant offers.

Capacity building during the project

The September workshop, *Effect of irrigation and harvesting age on the growth, yield and chemical composition of Pelargonium sidoides* DC, provided three WRC-funded students the opportunity to present the results of their research. Phila-Sande Ntoyi (registered at the Department of Biotechnology, UWC) presented on the morpho-physiological and biochemical responses of *P. sidoides* leaves to water stress; Yandiswa Mtimkulu (studying towards a PhD degree in Agriculture at CPUT) presented on the morphophysiological responses, yield and nutritional composition of *P. sidoides* to water stress at different harvest age; and Kundani Khameli (registered at the University of Johannesburg (UJ) for a PhD degree in Biotechnology) presented on the root chemical composition of *Pelargonium sidoides* in response to irrigation and harvesting age.

strategy shift. The commission's Strategic Plan for 2025/26 to 2029/30 emphasises real-world impact, stakeholder engagement, and knowledge uptake. Rather than producing reports that gather dust, Dr Hlophe-Ginindza says, the WRC is pursuing practical research that answers the question: "Then what?"

Key elements of this approach include stakeholder engagement, the use of demonstration sites to move research out of laboratories and into farmer fields, and co-producing knowledge by working alongside communities. Dr Hlophe-Ginindza adds that the new strategy calls for a focus on the entire value chain, and looking beyond production to marketing, processing, and opportunities for youth. Furthermore, the WRC is employing more accessible communication methods to disseminate research findings, including the use of YouTube videos, workshops, and plain-language summaries.

"Good science must always lead to action," she says. "It must change behaviour, create livelihoods, and improve resilience. Otherwise, we are only filling shelves with paper."

Looking ahead: from roots to livelihoods

The next steps for pelargonium research will be critical. The team hopes to continue monitoring plants to full maturity (four to five years) and develop practical irrigation and harvest guidelines. Dr Hlophe-Ginindza notes that establishing demonstration plots in farmer sites will ensure co-creation of knowledge and enhance its uptake. Additionally, training the youth and farmers would be an important step forward in ensuring communities benefit from the plant's cultivation and value chain development.

Prof Lewu adds that future research directions to consider include refining propagation techniques, explaining the plant's phytochemical properties, establishing policies to regulate harvesting and the formation of Public Private Partnerships, which he pointed out as "an important part moving forward."

A proposal for extended funding from the WRC has been submitted and is under consideration. Until then, Dr Lewu says they will continue to monitor the plants at the ARC.

To access the report, *Effect of irrigation and harvesting age on the growth, yield and chemical composition of Pelargonium sidoides* DC, (WRC Report No. 3201/1/25), visit: <https://wrcwebsite.azurewebsites.net/wp-content/uploads/mdocs/3201%20final.pdf>

Medicinal uses of Pelargonium siloides:

