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Pergularia daemia as a Novel Bioindicator of Soil Fertility: A Comprehensive Phytochemical and Agronomic Study

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ABSTRACT Soil fertility degradation threatens sustainable agriculture, especially in developing countries. This study evaluated *Pergularia daemia* as a bioindicator of soil fertility and examined its combined effect with termite soil on crop productivity. Phytochemical screening of leaves, stems, roots, and flowers using different solvent systems showed that ethanolic extracts contained the highest levels of alkaloids, flavonoids, and phenols. HPLC analyses confirmed the presence of important bioactive compounds. A 30-day pot experiment using *Pennisetum glaucum* compared sterile soil, termite soil, and treatments with *P. daemia*. The combination of termite soil and *P. daemia* produced the greatest plant growth and improved nitrogen and phosphorus levels. Beneficial microorganisms such as *Citrobacter freundii*, *Paenibacillus sp*. and *Lactococcus sp*. were also identified. The findings highlight a low-cost, eco-friendly strategy for improving soil fertility and sustainable agriculture.