

**Development, phonotaxis and management of
Gryllotalpa africana Palisot de Beauvois (Orthoptera:
Gryllotalpidae) on turfgrass**

by

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SUMMARY

Grylotalpa africana Palisot de Beauvois only occurs in Africa and is the only mole cricket turfgrass pest known in South Africa. Life stage occurrence was ascertained over one year by using an irritating drench. Male stridulation was investigated by recordings made during autumn and spring and by measuring sound pressure levels. The phonotactic response over 12 months was quantified by broadcasting a male *G. africana* song recording at 93.7 dB. A synthetic caller was set to the carrier frequency; syllable repetition rate and duty cycle of male *G. africana* song and tested for attracting *G. africana* from November to February. Fipronil (Regent), fipronil (Termidor), thiamethoxam (Actara) and furfural (Crop Guard) were evaluated in two independent field trials, for controlling an early instar nymph population and a late instar nymph/adult population of *G. africana* over 28 days, respectively. The studies were conducted in Pretoria, Gauteng, South Africa.

Oviposition of *G. africana* took place from early October (spring). Nymphs reached the adult stage from March (late summer) and the majority of individuals overwintered in this stage. Adult numbers peaked in early September (early spring), declining through the season. *Grylotalpa africana* was therefore univoltine in the study area. The adult population was female biased in spring. On average, the smallest individuals were sampled in December (early summer), whilst the smallest nymphs occurred in November (late spring). Male *G. africana* stridulated from spring to autumn. The carrier frequency (2.161 – 2.477 kHz) and syllable duration (7.340 – 12.078 ms) of calls showed no significant relationship with soil temperature and no significant differences between autumn and spring (soil temperature constant). Syllable period (10.455 – 17.221 ms) and inter syllable interval (1.912 – 9.607 ms) were significantly negatively correlated with soil temperature, and significantly longer in spring than in autumn (with soil temperature constant). The syllable repetition rate (0.058 – 0.096 syllables / ms) and duty cycle (43.31 – 81.72 %) showed a significant positive relationship with soil temperature and significant decrease in values (soil temperature constant) in spring (relative to autumn). Sound pressure levels of *G. africana* varied from 77.6 to 89.8 dB. Adult *G. africana* flew to the song broadcast from spring to autumn, with



activity peaking mid spring and late summer/early autumn. Only spring flights were significantly gender biased (female bias). The sex ratio of flying individuals (monthly) and mole crickets in the field was similar. Flying females were reproductively mature in spring/early summer and contained eggs from late spring. Flight activity of conspecifics and genders were significantly positively related to air and soil temperature, but unrelated to moon phase. The synthetic caller attracted *G. africana*. Low numbers attracted were attributed to the low broadcast sound pressure level. Fipronil and thiamethoxam controlled early instar nymphs and will be optimally applied during eclosion in November. Only fipronil controlled the late instar nymph/adult population.

SAMEVATTING

Gryllotalpa africana Palisot de Beauvois kom slegs in Afrika voor en is die enigste molkriek plaag spesie van turfgras in Suid-Afrika. Lewensfase voorkoms (oor 'n jaar) was bepaal deur 'n irriterende oplossing te gebruik. Manlike stridulasie was ondersoek deur opnames gedurende herfs en lente te maak en deur klank-drukvlakke te bepaal. Die phonotaktiese reaksie oor 12 maande was bespeur deur 'n manlike *G. africana* sang opname teen 93.7 dB uit te saai. 'n Geluiduitsaaier was ingestel tot die draer frekwensie; puls-herhalings-tempo en werks-tempo van manlike *G. africana* sang en getoets van November to Februarie vir die vermoë om *G. africana* te lok. Fipronil (Regent), fipronil (Termidor), thiamethoxam (Actara) and furfural (Crop Guard) was getoets in twee onafhanklike veldproewe, om 'n vroeë instar nimf bevolking en 'n laat instar nimf/volwassene bevolking van *G. africana* oor 28 dae respektiewelik te beheer. Die studies was onderneem in Pretoria, Gauteng, Suid-Afrika.

Oviposisie van *G. africana* het vanaf vroeg Oktober (lente) voorgekom. Nimfe het ontwikkel tot volwassenes vanaf Maart (laat somer) en die meerderheid van individue het as volwassenes oor-winter. Volwassenes het 'n maksimum hoeveelheid tydens vroeg September (vroeë lente) bereik, waarna hoeveelhede deur die seisoen verminder het. Derhalwe was *G. africana* univoltyn in die studie area. Die bevolking was vroulik-neigend tydens die lente. Die gemiddeld kleinste individue was in Desember (vroeë somer) gevind, terwyl die kleinste nimfe in November (laat lente) voorgekom het. Manlike *G. africana* het vanaf die lente tot die herfs gestriduleer. Die draer frekwensie (2.161 – 2.477 kHz) en puls tydperk (7.340 – 12.078 ms) van die sang het nie 'n betekenisvolle verwantskap met grondtemperatuur en ook geen wesenlike verskille tussen herfs en lente getoon nie (met grondtemperatuur konstant). Die puls tydperk (10.455 – 17.221 ms) en inter-puls-interval (1.912 – 9.607 ms) was betekenisvol negatief gekorreleer met grondtemperatuur, en met laasgenoemde konstant, betekenisvol langer in die lente as in die herfs. Die puls-herhalings-tempo (0.058 – 0.096 syllables / ms) en werks-tempo (43.31 – 81.72 %) het 'n wesenlike positiewe verhouding met grondtemperatuur en betekenisvolle afname in waardes (grondtemperatuur konstant) gedurende lente

(relatief tot herfs) getoon. Klank-druk-vlakke het gevarieer tussen 77.6 to 89.8 dB. Volwasse *G. africana* het vanaf lente tot herfs na die sang uitsending gevlieg en 'n piek in aktiwiteit gedurende middel lente en laat somer/vroeg herfs bereik. Slegs die lente vlugte was wesenlik geslagsbevooroordeel (vroulik-neigend). Die geslagsverhouding (maandeliks) van vlieënde individue en molkrieke in die veld was soortgelyk. Vlieënde wyfies was reprodktief volwasse tydens lente/vroeg somer en het eiers vanaf laat lente gehad. Die konspesifieke - en geslags vlieg aktiwiteit was betekenisvol positief verwant aan grond en lug temperatuur, maar onverwant tot maanfase. Die geluiduitsaaier het *G. africana* gelok. Die lae hoeveelhede wat aangelok is was hoofsaaklik toegeskryf aan die lae uitsending klank-druk-vlak. fipronil en thiamethoxam het vroeë instar nimfe beheer en sal optimaal toegedien word tydens eklosie in November. Slegs fipronil het die laat instar nimf/volwassene bevolking beheer.

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