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ANTIFUNGAL DEPSIPEPTIDE COMPOUNDS FROM *Paenibacillus polymyxa* HY96-2

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Paenibacillus polymyxa can produce many peptide antibiotics, including polymyxins [1], gatavalin [2], jolipeptin [3], tridecaptins [4], the peptide complex named LI-F [5, 6], gavaserin [7], saltavalin [7], fusaricidins A–D [8–10], and so on. Many of them have been described to exhibit antimicrobial activities against certain human pathogens but only a minor number of plant pathogens.

In the course of our search for agricultural antibiotics, we have isolated three antifungal depsipeptides from the culture broth of *P. polymyxa* HY96-2 by bioassay-guided isolation techniques.

The culture broth (30 L) was acidified at pH 3.0 and heated at 80°C for 15 min. The acidified broth was centrifuged, and antifungal compounds were extracted from the supernatant with 3 volumes of *n*-BuOH. Then the *n*-BuOH layer was concentrated, and triple volumes of EtOAc were added to precipitate the crude antifungal extract. The crude extract was applied to a silica gel column eluted with $CHCl_3$–MeOH and a Sephadex LH-20 column eluted with MeOH, then purified by preparative RP-HPLC with 32% CH_3CN in 0.1% TFA. Finally, we obtain compound **1** (20 mg) and a mixture of compounds **2** and **3** (10 mg).

On the basis of spectrum analysis, compounds **1**, **2**, and **3** were identified as fusaricidin A, C, and D, respectively. Fusaricidin A showed strong and broad-spectrum antimicrobial activity against 16 tested plant pathogenic strains. The minimal inhibitory concentrations (MICs) of fusaricidin A against *Fusarium oxysporum, Thanatephorus cucumeris* (Frank) Donk., *Rhizoctonia solani, Erwinia carotovora var. carotovora*, and *Bacillus subtilis* are 12.5 μg/mL, 25 μg/mL, 25 μg/mL, 6.25 μg/mL, and 6.25 μg/mL (Table 1), respectively. The results widened the antifungal spectrum and showed good prospects for the application of fusaricidin A in agriculture.

TABLE 1. The Antimicrobial Activity of Fusaricidin A

Indicator strain	MIC, μg/mL	Indicator strain	MIC, μg/mL
Fusarium semitectum	50	*Penicillium thomii*	50
Verticillium albo-atrum	25	*Curvularia lunata*	25
T. cucumeris (Frank) Donk.	25	*Alternaria alternata* (Fries) Keissler	25
Alternaria longipes	25	*Colletrichum lagenarium*	25
Fusarium graminearum Schw.	50	*Sclerotium* sp.	25
Alternaria sp.	25	*B. subtilis**	6.25
R. solani	25	*E. carotovora var. carotovora**	6.25
F. oxysporum f. sp. *cucumerinum*	12.5	*Escherichia coli**	> 200
F. oxysporum sp. cuberse(E. F. Simth) Snyder ethansen	12.5	*Xanthomona oryzae**	> 200
Alternaria Solani	25		

Medium – PDA, *Medium – LB.

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