

论文

麦长管蚜 (*Sitobion avenae* F.) 危害对春小麦面粉品质性状及面团流变学特性的影响

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摘要:

选用2个抗麦长管蚜(*Sitobion avenae* F.)小麦材料及4个感蚜材料, 利用人工接种方法研究了该蚜虫危害对小麦面粉品质的影响。结果表明, 蚜虫取食对面粉颗粒度没有显著影响, 但可引起小麦面粉灰分含量显著增加, 蛋白质含量、SDS沉降值、面团筋力、膨胀指数、面团延伸性、面团弹性、弹性指数显著降低, 从而降低面粉品质。抗蚜小麦04-9284、C272及感蚜硬质小麦甘春20部分品质指标不发生变化或变化程度低于其他3个感蚜软质小麦。5个软质小麦蚜量高峰值与膨胀指数、面团弹性、SDS沉降值、面团筋力和蛋白质含量品质的降低幅度呈正相关, 相关系数分别为0.9968、0.9619、0.9310、0.9108和0.8886, 均达显著水平; 与灰分含量、面团延伸性和弹性指数相关性不显著。甘肃兰州拉面专用品种甘春20在高密度蚜虫危害后, 面粉品质下降, 但依然符合该专用粉的最适品质要求。

关键词: 抗蚜性 小麦 面粉品质 籽粒硬度 蚜虫

Responses of Flour Quality and Dough Rheological Properties to *Stiobion avenae* F. Inoculated in Spring Wheat

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Abstract:

Sitobion avenae F., one of the important aphid species infesting spring wheat (*Triticum aestivum* L.) in western China, causes not only yield loss but also quality degradation of wheat flour. In the authors' earlier studies, two wheat lines with high resistance to *S. avenae*, 04-9284 and C272 were screened out from 521 accessions. Another five highly susceptible cultivars (lines) were also identified, including a specific cultivar "Guanchun 20" for Lanzhou hand-stretched noodles. The aims of the present study were to compare quality differences of resistant and susceptible wheat lines inoculated with aphids, and to assess the contributions of grain hardness and gliadin to aphid resistance. The lines 04-9284 and C272 (soft grain) were used as resistant lines, and four cultivars (lines), Ganchun 20 (hard grain) as well as Ganchuan 18, C162, and C167 (soft grain with specific ω gliadin in grains after aphid infecting) were susceptible to *S. avenae*. After artificial inoculation with *S. avenae* on 5 June, the density of aphid population was measured from 15 June to 20 July at an interval of 6–7 d. Flour quality and dough rheological properties were determined after grain maturing. The mean density of aphid population at peak occurrence was 4.3-fold higher in susceptible lines than in resistant lines. Aphid infecting resulted in no significant change in flour granule ($t = 0.4312, P = 0.68$), but induced significant increase in ash content ($t = 2.9207, P = 0.03$) and reductions in protein content ($t = 2.5444, P = 0.05$), SDS sedimentation value ($t = 4.5736, P = 0.01$), strength ($t = 4.2517, P = 0.01$), swelling ($t = 6.6691, P = 0.00$), extensibility ($t = 3.1826, P = 0.02$), tenacity ($t = 3.6653, P = 0.01$), and index of elastic ($t = 2.8750, P = 0.03$). In susceptible lines Ganchun 18, C162, and C167, aphid infecting significantly reduced quality parameters mentioned above excluding flour gradual and ash content. Ganchun 20 showed less influence than the other three susceptible lines, its protein content, swelling, and extensibility reduced insignificantly, and the other parameters decreased slightly. In resistant lines 04-9284 and C272, there were significant variations after aphid infecting only in strength and extensibility with much smaller values than those in the three susceptible lines. Correlation analysis showed that the peak aphid density in the five lines with soft grain was positively correlated with the decrease percentages of quality parameters, such as swelling ($r = 0.9968, P < 0.01$), tenacity ($r =$

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0.9619, $P < 0.01$), SDS sedimentation, strength ($r = 0.9108, P < 0.05$), and protein content ($r = 0.8886, P < 0.05$). With respect to the hard-grain cultivar Ganchun 20, the flour quality was still qualified for processing hand-stretched noodles even at the high density of 214.67 aphids per tiller. Field investigation showed that the peak density of *S. avenae* on Ganchun 20 was 122.36–154.33 heads per tiller in common years, which is much fewer than that in this study. Therefore, Ganchun 20 is not degraded seriously in flour quality under normal occurrence of *S. avenae* and possesses a relative stability of quality in response to the infecting of aphid.

Keywords: Aphids resistance Wheat Flour quality Grain hardness Aphid

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