附表 1 285 个小麦品种在低氮胁迫后基于隶属函数值的评价结果

Supplementary Table 1 The evaluation results of 285 wheat varieties based on membership function values after low nitrogen stress

| 编号<br>Number | 品种<br>Variety | *D* 值<br>Comprehensive evaluation value | 类型<br>Type |
|---|---|---|---|
| WN-1 | 2023-CY6100-0016-9 | 0.5980 | IV |
| WN-2 | 2023-8003-2 | 0.3140 | II |
| WN-3 | 2023-7005-2 | 0.4470 | III |
| WN-4 | 2023-10-001-4 | 0.4799 | III |
| WN-5 | 2023-7001-1 | 0.3219 | II |
| WN-6 | 2023-7001-4 | 0.4728 | III |
| WN-7 | 2023-7004-3 | 0.3550 | III |
| WN-8 | 24-品-0011<br>24-pin-0011 | 0.6020 | IV |
| WN-9 | 24-品-0013<br>24-pin-0013 | 0.4116 | III |
| WN-10 | 25-品-0015<br>25-pin-0015 | 0.3269 | II |
| WN-11 | 24-品-0016<br>24-pin-0016 | 0.3361 | II |
| WN-12 | 25-品-0020<br>25-pin-0020 | 0.5771 | IV |
| WN-13 | 陇春 39<br>Longchun 39 | 0.4207 | III |
| WN-14 | M59 | 0.4593 | III |
| WN-15 | 宁作 06-10<br>Ningzuo 06-10 | 0.5471 | IV |
| WN-16 | E-36-38 | 0.3218 | II |
| WN-17 | 永春 10 号<br>Yongchun 10 | 0.3552 | III |
| WN-18 | 未知 u744<br>Weizhi u744 | 0.5900 | IV |
| WN-19 | W507 | 0.3476 | III |
| WN-21 | 郑 9203<br>Zheng 9203 | 0.5480 | IV |
| WN-22 | M142-1 | 0.3160 | II |
| WN-23 | 南大 96-4936<br>Nanda 96-4936 | 0.4415 | III |
| WN-24 | 2901 | 0.3759 | III |
| WN-25 | M-594-1 | 0.4567 | III |
| WN-26 | 永 765<br>Yong 765 | 0.4570 | III |
| WN-27 | 辽武 10<br>Liaowu 10 | 0.3161 | II |

| | | | |
|---|---|---|---|
| WN-28 | 巴 0802793<br>Ba 0802793 | 0.4651 | III |
| WN-29 | 高原 338<br>Gaoyuan 338 | 0.4539 | III |
| WN-30 | 95EW21 | 0.4664 | III |
| WN-31 | YZ56 | 0.3717 | III |
| WN-32 | 甘春 8<br>Ganchun 8 | 0.3494 | III |
| WN-33 | 永 373<br>Yong 373 | 0.3587 | III |
| WN-34 | M5N2 | 0.4423 | III |
| WN-35 | 55XO9 | 0.3919 | III |
| WN-36 | Z120-2 | 0.4120 | III |
| WN-37 | 40I13WSVO | 0.4139 | III |
| WN-38 | 青春 27 号<br>Qingchun 27 | 0.3721 | III |
| WN-39 | M-180 | 0.4231 | III |
| WN-41 | JJK09 | 0.4230 | III |
| WN-42 | 三抚 5076<br>Sanfu 5076 | 0.4719 | III |
| WN-43 | MS10201 | 0.5285 | IV |
| WN-44 | 甘春 0058<br>Ganchun 0058 | 0.3864 | III |
| WN-45 | 陇春 2609<br>Longchun 2609 | 0.5168 | IV |
| WN-46 | Z8E30YF-22 | 0.3496 | III |
| WN-47 | 124600 | 0.4533 | III |
| WN-48 | M007 | 0.5613 | IV |
| WN-49 | 中华 871<br>Zhonghua 871 | 0.6594 | V |
| WN-50 | SMP-7257 | 0.3602 | III |
| WN-51 | 临 B90<br>Lin B90 | 0.2876 | II |
| WN-52 | E08V37 | 0.4971 | III |
| WN-53 | sto9131 | 0.4305 | III |
| WN-54 | Po882LS3 | 0.5477 | IV |
| WN-55 | 洛 24318<br>Luo 24318 | 0.3166 | II |
| WN-56 | sto9-131 | 0.3505 | III |
| WN-57 | 青春 53<br>Qingchun 53 | 0.2754 | II |
| WN-58 | 永 3257<br>Yong 3257 | 0.4034 | III |
| WN-59 | 永春 4 号 | 0.4446 | III |

| | | | |
|---|---|---|---|
| | Yongchun 4 | | |
| WN-61 | 1470 | 0.2908 | II |
| WN-62 | 宁作 26<br>Ningzuo 26 | 0.5533 | IV |
| WN-63 | 武春 3 号<br>Wuchun 3 | 0.4422 | III |
| WN-64 | Y256 | 0.4687 | III |
| WN-65 | 宁春 47<br>Ningchun 47 | 0.4243 | III |
| WN-66 | 永 794<br>Yong 794 | 0.4348 | III |
| WN-67 | 青春-53<br>Qingchun-53 | 0.3113 | II |
| WN-68 | 中华 871<br>Zhonghua 871 | 0.3957 | III |
| WN-69 | 12-144-23281 | 0.2630 | II |
| WN-70 | 永 765<br>Yong 765 | 0.5149 | IV |
| WN-71 | 武春 3 号<br>Wuchun 3 | 0.4321 | III |
| WN-72 | 宁作 06-10<br>Ningzuo 06-10 | 0.3298 | II |
| WN-73 | 宁春 4 号<br>Ningchun 4 | 0.3481 | III |
| WN-74 | JJX09-166 | 0.3975 | III |
| WN-75 | IBWSN93 | 0.3824 | III |
| WN-76 | 4W507 | 0.4832 | III |
| WN-77 | 2BWSN-158 | 0.4070 | III |
| WN-78 | 永 2555<br>Yong 2555 | 0.4717 | III |
| WN-79 | Z14-2182 | 0.4076 | III |
| WN-81 | 779430 | 0.3809 | III |
| WN-82 | 罗布 12-127<br>Luobu 12-127 | 0.3577 | III |
| WN-83 | 0213WSN93 | 0.4485 | III |
| WN-84 | B08 | 0.5170 | IV |
| WN-85 | 陇春 3939<br>Longchun 3939 | 0.3916 | III |
| WN-86 | 永春 2916<br>Yongchun 2916 | 0.3047 | II |
| WN-87 | 2Z5365 | 0.3899 | III |
| WN-88 | 新春 2 号<br>Xinchun 2 | 0.4469 | III |
| WN-89 | 12-144 | 0.4828 | III |

| | | | |
|---|---|---|---|
| WN-90 | 99W744-2 | 0.4374 | III |
| WN-91 | 宁作 230<br>Ningzuo 230 | 0.5447 | IV |
| WN-92 | 罗布 12-122<br>Luobu12-122 | 0.4079 | III |
| WN-93 | 8-126-20 | 0.3603 | III |
| WN-94 | 永-2901<br>Yong-2901 | 0.4158 | III |
| WN-95 | 津强 8<br>Jinqiang 8 | 0.4750 | III |
| WN-96 | 津强 9<br>Jinqiang 9 | 0.3164 | II |
| WN-97 | 津强 10<br>Jinqiang 10 | 0.4357 | III |
| WN-98 | 津强 1<br>Jinqiang 1 | 0.4909 | III |
| WN-99 | 津强 12<br>Jinqiang 12 | 0.3167 | II |
| WN-101 | 沃春 1<br>Wochun 1 | 0.2118 | II |
| WN-102 | 沃春 2<br>Wochun 2 | 0.4477 | III |
| WN-103 | 沃春 3<br>Wochun 3 | 0.3375 | II |
| WN-104 | 沃春 7<br>Wochun 7 | 0.4139 | III |
| WN-105 | 沃春 8<br>Wochun 8 | 0.3832 | III |
| WN-106 | 沃春黑 1 号<br>Wochunhei 1 | 0.3169 | II |
| WN-107 | 宁春 61<br>Ningchun 61 | 0.3147 | II |
| WN-108 | 宁 2038<br>Ning 2038 | 0.5461 | IV |
| WN-109 | m8887 | 0.5468 | IV |
| WN-110 | MJ300 | 0.4652 | III |
| WN-111 | MJ551 | 0.4153 | III |
| WN-112 | WM-1 | 0.3888 | III |
| WN-113 | F-137 | 0.4855 | III |
| WN-114 | F-138 | 0.3497 | III |
| WN-115 | H-4 | 0.3861 | III |
| WN-116 | H-6 | 0.5194 | IV |
| WN-117 | CY-0009 | 0.5200 | IV |
| WN-118 | CY-0013 | 0.4222 | III |

| | | | |
|---|---|---|---|
| WN-119 | CY-0021 | 0.3349 | II |
| WN-121 | CY-0024 | 0.4324 | III |
| WN-122 | CY-0029 | 0.3599 | III |
| WN-123 | CY-0033 | 0.4148 | III |
| WN-124 | CY-0041 | 0.5478 | IV |
| WN-125 | CY-0043 | 0.3249 | II |
| WN-126 | CY-0047 | 0.4955 | III |
| WN-127 | CY-0050 | 0.2444 | II |
| WN-128 | CY-0051 | 0.4656 | III |
| WN-129 | CY-0052 | 0.4377 | III |
| WN-130 | CY-0054 | 0.5313 | IV |
| WN-131 | CY-0058 | 0.3080 | II |
| WN-132 | CY-0062 | 0.4900 | III |
| WN-133 | CY-0065 | 0.3201 | II |
| WN-134 | CY-0072 | 0.3658 | III |
| WN-135 | CY-0075 | 0.4764 | III |
| WN-136 | CY-0078 | 0.3760 | III |
| WN-137 | CY-0081 | 0.3894 | III |
| WN-138 | CY-0089 | 0.3210 | II |
| WN-139 | CY-00101 | 0.5670 | IV |
| WN-141 | CY-0103 | 0.3618 | III |
| WN-142 | CY-0105 | 0.2970 | II |
| WN-143 | CY-0108 | 0.3924 | III |
| WN-144 | CY-0113 | 0.3597 | III |
| WN-145 | CY-0116 | 0.3259 | II |
| WN-146 | CY-0125 | 0.3368 | II |
| WN-147 | CY-0128 | 0.4415 | III |
| WN-148 | CY-0158 | 0.3858 | III |
| WN-149 | CY-0161 | 0.1803 | I |
| WN-150 | CY-0167 | 0.3973 | III |
| WN-151 | CY-0172 | 0.3497 | III |
| WN-152 | CY-0174 | 0.2641 | II |
| WN-153 | CY-0185 | 0.3628 | III |
| WN-154 | CY-0204 | 0.3295 | II |
| WN-155 | CY-0208 | 0.4047 | III |
| WN-156 | CY-0210 | 0.4263 | III |
| WN-157 | CY-0213 | 0.3525 | III |
| WN-158 | CY-0217 | 0.5058 | III |
| WN-159 | CY-0223 | 0.3444 | III |
| WN-161 | CY-0232 | 0.3585 | III |
| WN-162 | CY-0244 | 0.3716 | III |
| WN-163 | CY-0246 | 0.5956 | IV |
| WN-164 | CY-0250 | 0.3869 | III |
| WN-165 | CY-0253 | 0.4130 | III |

| | | | |
|---|---|---|---|
| WN-166 | CY-0255 | 0.4016 | III |
| WN-167 | CY-0282 | 0.4539 | III |
| WN-168 | CY-0291 | 0.3943 | III |
| WN-169 | CY-0294 | 0.3392 | II |
| WN-170 | CY-0312 | 0.4790 | III |
| WN-171 | CY-0316 | 0.4148 | III |
| WN-172 | CY-0319 | 0.3247 | II |
| WN-173 | CY-0322 | 0.3652 | III |
| WN-174 | CY-0327 | 0.3868 | III |
| WN-175 | CY-0332 | 0.5005 | III |
| WN-176 | CY-0336 | 0.4076 | III |
| WN-177 | CY-0338 | 0.4611 | III |
| WN-178 | CY-0341 | 0.5599 | IV |
| WN-179 | CY-0345 | 0.6019 | IV |
| WN-181 | CY-0348 | 0.4310 | III |
| WN-182 | 54IBWSN(1001) | 0.4814 | III |
| WN-183 | 54IBWSN(1002) | 0.4508 | III |
| WN-184 | 54IBWSN(1003) | 0.3646 | III |
| WN-185 | 54IBWSN(1004) | 0.3757 | III |
| WN-186 | 54IBWSN(1005) | 0.6790 | V |
| WN-187 | 54IBWSN(1006) | 0.4449 | III |
| WN-188 | 54IBWSN(1007) | 0.5220 | IV |
| WN-189 | 54IBWSN(1008) | 0.5035 | III |
| WN-190 | 54IBWSN(1009) | 0.2832 | II |
| WN-191 | 54IBWSN(1010) | 0.3331 | II |
| WN-192 | 54IBWSN(1011) | 0.4904 | III |
| WN-193 | 54IBWSN(1012) | 0.3930 | III |
| WN-194 | 54IBWSN(1013) | 0.4134 | III |
| WN-195 | 54IBWSN(1014) | 0.4017 | III |
| WN-196 | 54IBWSN(1015) | 0.3805 | III |
| WN-197 | 54IBWSN(1017) | 0.4089 | III |
| WN-198 | 54IBWSN(1019) | 0.3744 | III |
| WN-199 | 54IBWSN(1020) | 0.3934 | III |
| WN-201 | 54IBWSN(1023) | 0.2442 | II |
| WN-202 | 54IBWSN(1024) | 0.3132 | II |
| WN-203 | 54IBWSN(1026) | 0.5469 | IV |
| WN-204 | 54IBWSN(1029) | 0.3973 | III |
| WN-205 | 54IBWSN(1032) | 0.4024 | III |
| WN-206 | 54IBWSN(1038) | 0.3904 | III |
| WN-207 | 54IBWSN(1039) | 0.3791 | III |
| WN-208 | 54IBWSN(1040) | 0.5279 | IV |
| WN-209 | 54IBWSN(1046) | 0.4759 | III |
| WN-210 | 54IBWSN(1048) | 0.4039 | III |
| WN-211 | 54IBWSN(1049) | 0.4226 | III |

| | | | |
|---|---|---|---|
| WN-212 | 54IBWSN(1051) | 0.4697 | III |
| WN-213 | 54IBWSN(1052) | 0.4136 | III |
| WN-214 | 54IBWSN(1053) | 0.3918 | III |
| WN-215 | 54IBWSN(1054) | 0.4443 | III |
| WN-216 | 54IBWSN(1055) | 0.4973 | III |
| WN-217 | 54IBWSN(1056) | 0.4239 | III |
| WN-218 | 54IBWSN(1057) | 0.4684 | III |
| WN-219 | 54IBWSN(1060) | 0.3819 | III |
| WN-221 | 54IBWSN(1061) | 0.5203 | IV |
| WN-222 | 54IBWSN(1062) | 0.4714 | III |
| WN-223 | 54IBWSN(1063) | 0.4364 | III |
| WN-224 | 54IBWSN(1064) | 0.3100 | II |
| WN-225 | 54IBWSN(1070) | 0.4000 | III |
| WN-226 | 54IBWSN(1071) | 0.4161 | III |
| WN-227 | 54IBWSN(1072) | 0.3292 | II |
| WN-228 | 54IBWSN(1073) | 0.3613 | III |
| WN-229 | 54IBWSN(1074) | 0.4601 | III |
| WN-230 | 54IBWSN(1077) | 0.4773 | III |
| WN-231 | 54IBWSN(1078) | 0.3335 | II |
| WN-232 | 54IBWSN(1079) | 0.4456 | III |
| WN-233 | 54IBWSN(1080) | 0.4569 | III |
| WN-234 | 54IBWSN(1082) | 0.3045 | II |
| WN-235 | 54IBWSN(1083) | 0.6976 | V |
| WN-236 | 54IBWSN(1085) | 0.4785 | III |
| WN-237 | 54IBWSN(1086) | 0.6842 | V |
| WN-238 | 54IBWSN(1087) | 0.4640 | III |
| WN-239 | 54IBWSN(1088) | 0.6072 | IV |
| WN-241 | 54IBWSN(1093) | 0.2658 | II |
| WN-242 | 54IBWSN(1095) | 0.2966 | II |
| WN-243 | 54IBWSN(1096) | 0.2304 | II |
| WN-244 | 54IBWSN(1097) | 0.1714 | I |
| WN-245 | 54IBWSN(1098) | 0.2643 | II |
| WN-246 | 54IBWSN(1099) | 0.2939 | II |
| WN-247 | 54IBWSN(1101) | 0.1560 | I |
| WN-248 | 54IBWSN(1102) | 0.3377 | II |
| WN-249 | 54IBWSN(1103) | 0.1945 | I |
| WN-250 | 54IBWSN(1104) | 0.2534 | II |
| WN-251 | 54IBWSN(1105) | 0.2874 | II |
| WN-252 | 54IBWSN(1114) | 0.3096 | II |
| WN-253 | 54IBWSN(1115) | 0.3385 | II |
| WN-254 | 54IBWSN(1118) | 0.2986 | II |
| WN-255 | 54IBWSN(1119) | 0.2612 | II |
| WN-256 | 54IBWSN(1120) | 0.3224 | II |
| WN-257 | 54IBWSN(1121) | 0.2933 | II |

| | | | |
|---|---|---|---|
| WN-258 | 54IBWSN(1122) | 0.2639 | II |
| WN-259 | 54IBWSN(1123) | 0.2670 | II |
| WN-261 | 54IBWSN(1124) | 0.2532 | II |
| WN-262 | 54IBWSN(1127) | 0.3142 | II |
| WN-263 | 54IBWSN(1129) | 0.2845 | II |
| WN-264 | 54IBWSN(1130) | 0.3227 | II |
| WN-265 | 54IBWSN(1131) | 0.3145 | II |
| WN-266 | 54IBWSN(1132) | 0.2614 | II |
| WN-267 | 54IBWSN(1133) | 0.3079 | II |
| WN-268 | 54IBWSN(1134) | 0.2708 | II |
| WN-269 | 54IBWSN(1136) | 0.1495 | I |
| WN-270 | 54IBWSN(1137) | 0.3501 | III |
| WN-271 | 54IBWSN(1138) | 0.3421 | III |
| WN-272 | 54IBWSN(1140) | 0.3931 | III |
| WN-273 | 54IBWSN(1141) | 0.2877 | II |
| WN-274 | 54IBWSN(1142) | 0.3345 | II |
| WN-275 | 54IBWSN(1143) | 0.2953 | II |
| WN-276 | 54IBWSN(1144) | 0.3291 | II |
| WN-277 | 54IBWSN(1145) | 0.3481 | III |
| WN-278 | 54IBWSN(1146) | 0.3446 | III |
| WN-279 | 54IBWSN(1147) | 0.3095 | II |
| WN-281 | 54IBWSN(1148) | 0.2973 | II |
| WN-282 | 54IBWSN(1151) | 0.2613 | II |
| WN-283 | 54IBWSN(1152) | 0.3324 | II |
| WN-284 | 54IBWSN(1154) | 0.2887 | II |
| WN-285 | 54IBWSN(1155) | 0.2932 | II |
| WN-286 | 54IBWSN(1158) | 0.3144 | II |
| WN-287 | 54IBWSN(1159) | 0.2361 | II |
| WN-288 | 54IBWSN(1160) | 0.2461 | II |
| WN-289 | 54IBWSN(1162) | 0.3923 | III |
| WN-290 | 54IBWSN(1164) | 0.3692 | III |
| WN-291 | 54IBWSN(1167) | 0.2482 | II |
| WN-292 | 54IBWSN(1168) | 0.2381 | II |
| WN-293 | 54IBWSN(1169) | 0.2201 | II |
| WN-294 | 54IBWSN(1172) | 0.6950 | V |
| WN-295 | 54IBWSN(1174) | 0.3696 | III |
| WN-296 | 54IBWSN(1176) | 0.3063 | II |
| WN-297 | 54IBWSN(1177) | 0.2257 | II |
| WN-298 | 54IBWSN(1179) | 0.3435 | III |
| WN-299 | 54IBWSN(1180) | 0.3755 | III |

I：氮极敏感利用材料；II：氮敏感利用材料；III：氮中效利用材料；IV：氮高效利用材料；V：氮极高效利用材料。红色字体代表 285 份材料中的 2 个极端材料

I: the nitrogen extremely sensitive type; II: the nitrogen sensitive type; III: the nitrogen medium effective type; IV:the high NUE materials;V:the ultra high NUE materials. The red font in the figure represents two extreme materials among the 285 materials

附表 2 WN-269 苗长综合评价值计算过程

Supplementary Table 2 The calculation process of comprehensive assessment value (*D*) for seedling length of WN-269

| 计算步骤<br>Calculating procedure | 指标<br>Index | 参数数值<br>Parameter value | 备注<br>Remark |
|---|---|---|---|
| 原始数据<br>Raw data | 正常氮下苗长<br>Seedling length under normal nitrogen | 14.80 | cm |
| | 低氮下苗长<br>Seedling length under low nitrogen | 9.20 | cm |
| 耐低氮系数<br>Nitrogen-tolerance index coefficient | 苗长耐低氮系数<br>Low nitrogen tolerance coefficient of seedling length | 0.62 | 9.20/14.80 |
| 主成分得分<br>Principal component score ($C_1$) | $C_1$ | -2.60 | 通过主成分模型计算(提取前四个主成分)<br>Calculated by the principal component model (extract the first four principal components)<br>$C_{1max/min}$：4.01，-2.60<br>$C_{2max/min}$：5.36，-2.69<br>$C_{3max/min}$：4.27，-3.81<br>$C_{4max/min}$：3.73，-2.45 |
| | $C_2$ | 0.74 | |
| | $C_3$ | -0.23 | |
| | $C_4$ | -1.17 | |
| 权重<br>Weight | $W_1$ | 0.61 | $W_i=P_i/\sum_{i=1}^{m} P_i$<br>$W_1$=55.32/（55.32+15.02+12.43+7.85） |
| | $W_2$ | 0.17 | |
| | $W_3$ | 0.14 | |
| | $W_4$ | 0.09 | |
| 隶属函数值<br>Subordinate function values | ψ($C_1$) | 0 | $\psi(C_i)=(C_I-C_{min})/(C_{max}-C_{min})$<br>ψ($C_1$)=（-2.6-（-2.60））/（4.01-（-2.60））） |
| | ψ($C_2$) | 0.43 | |
| | ψ($C_3$) | 0.44 | |
| | ψ($C_4$) | 0.21 | |
| 综合评价值<br>Comprehensive evaluation value (*D*) | *D* | 0.15 | $D=\sum_{i=1}^{m}[\psi(C_i)\times W_i]$<br>*D*=0*0.61+0.43*0.16+0.44*0.13+0.21*0.09 |