IPM

1   1   1   2   3   1   1   1 *

1.   102206 2.   030012

3.   030000

2004   IPM

$P < 0.05$ $P <$

0.05 $P < 0.05$

$P < 0.05$ $P < 0.05$

$P < 0.05$

$P < 0.05$ $P < 0.05$

$P > 0.05$ $P < 0.05$

$P < 0.05$

70% $P < 0.05$ 70% $P <$

0.05 $P > 0.05$ IPM

The dominant species succession of community of natural enemies and pests at Jujube fields intercropped with herbage and IPM strategies of Jujube orchards

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Abstract To understand the Dominant species Succession of Community of natural Enemies and Pests at Jujube fields Intercropped with Herbage and IPM Strategies of orchards a systematic survey was made at the four different treatments of jujube fields located 2. 5 km west of Taigu 111°32′E 37°26′N 781.9 m elevation   Shanxi Province in 2004. The three treatments of the four different treatments of jujube fields were intercropped with herbage *Lotus comiculotus*   and the other one wasn′t intercropped with any herbage. Trees were 10 years old and in full fruit production with a height of 5 m and a shading-degree of 0. 4 – 0. 6 . In each of the four different treatments of jujube fields five trees were chosen according to the chessboard sampling method to monitor the population dynamics of the predacity enemies and pests. The trees were monitored every 10 days from March 10th to September 30th. Each of four treatments was replicated three times. The natural enemies and pests were distinguished based on their taxonomy. Abundance diversity indices of natural enemies and pests community principal component of dominant species and breadths and overlap of two-dimensional temporal-spatial niches of dominant species were used to analyze and compare the successions of natural enemies and pests at the four different treatments of jujube fields. IPM strategies of jujube orchards were exploded.

   The systematic survey showed that significantly more $P < 0. 05$ natural enemies were observed at jujube field intercropped with herbage than jujube field without herbage. Significantly more $P < 0.05$ natural enemies were found at integrated pest management jujube field intercropped with herbage than conventional pest management jujube field intercropped with herbage. In different developing periods of jujube trees significantly more $P < 0.05$ family species indices of diversity and evenness of pests were found at jujube field intercropped with herbage than at jujube field without herbage. However significantly bigger $P < 0.05$ dominant degree and individuals of pests were at jujube field without herbage than jujube field intercropped with herbage. Significantly bigger $P < 0.05$ family species indices of diversity and evenness dominant degree and individuals of natural enemies were at jujube field intercropped with herbage than jujube field without herbage and the same increase $P < 0.05$ of individuals at integrated pest management jujube field intercropped with herbage than conventional pest management jujube field intercropped with herbage. In different developing stages of jujube trees significantly bigger $P < 0. 05$ loadings of dominant species of natural enemy communities to the first two principal components were at jujube field intercropped with herbage than jujube field without herbage. However significantly bigger $P < 0. 05$ loadings of dominant species of pest communities to the first two principal components were at jujube field without herbage than jujube field intercropped with herbage. There was no difference between the breadths of two-dimensional temporal-spatial niches of pests in different developing stages of jujube trees at the jujube fields of different treatments. However the average breadths of two-dimensional temporal-spatial niches of dominant species of natural enemies were significantly bigger $P < 0.05$ at jujube field intercropped with herbage than jujube field without herbage. The average overlapped values of two-dimensional temporal-spatial niches between dominant species of natural enemies and pests were significantly bigger $P < 0.05$ at jujube field intercropped with herbage than jujube field without herbage. Average index of ratio of accumulative total contribution of more than 70% of natural enemies was significantly bigger $P < 0. 05$ at jujube field intercropped with herbage than jujube field without herbage. But significantly bigger $P < 0. 05$ the ratio of average index of pests were at jujube field without herbage than jujube field intercropped with herbage. There was a significant $P < 0. 05$ difference in the ratio of different developing periods of jujube trees at jujube orchards with different treatments. The results suggested that IPM of jujube orchards was putted in practice with different countermeasures in different developing periods of jujube trees.

Key Words jujube field intercropped with herbage dominant species of natural enemies and pests diversity principal component niches

Ziziphus jujuba

IPM   [1~5]

                                                                                          [6~11]

                                                        [12~13]

IPM   [14~16]

                                                                                                        IPM

1

1.1

                                        111°32′E 37°26′N   781.9 m 10   4

        1km ± 100m A   ——   *Lotus comiculotus*   B

                ——   C   ——

                D   ——

                3   666m^2

                                                                                6   15   8

    22   1   20%

    100ml 666m^{-2} 120ml 666m^{-2} 1

                5   1   4   22   20%   30ml 666m^{-2} 2

            5   8   2.5%   50g +25%   100g 666m^{-2} 3

    6   22   44%   30g +25%   100g 666m^{-2} 4   7   26

2.5%   50g +5%   10g 666m^{-2} 5   8   24   20%

    50g +73%   100g 666m^{-2}

1.2

                                                        5   2004   3   10   9   30

        10d   21   4

            3

                                        5   [17~22]

1.3

                                                        3   Ⅰ 3   10

~5   20   Ⅱ 5   21 ~7   20   Ⅲ 7   21   ~9   30

        85%

                    H'   *J'*   *D*   Shannon-Wiener

                        Shannon-Wiener

    SPSS 1999   Duncan   [23~36]

2

2. 1

12 37~40

1

1

$P < 0.05$

$P < 0.05$

$P < 0.05$

$P < 0.05$

$P < 0.05$

P < 0.05

$P > 0.05$ $P < 0.05$

$P < 0.05$

$P < 0.05$

$P < 0.05$

2. 2

Pseudococcus comstock Kuwane

Ancylis sativa Liu   *Contarinia* sp.   *Scythropus yasumatsui* Kono et Morimoto

Carposina niponensis Walsingham   2

2

$P < 0.05$

Inoccllia sp.   *Chrysopa sinica* Tjeder   *Lasius fuliginosus*

Latr.   *Typhladromus unlgaris* Ehata   *Lycosa sinensis* Schenkel   *Erigonidium*

graminicolum Sundevall

$P < 0.05$ 3 $P < 0.05$

$P < 0.05$

$P < 0.05$

1

2. 3

4

0. 8172 ±
0. 0220 ＞ 0. 7988 ± 0. 0129 ＞ 0. 7698 ± 0. 0074 ＞
0. 7532 ± 0. 0103 $P > 0.05$

0. 9057 ± 0. 0088 ＞ 0. 8600 ± 0. 0129 ＞ 0. 7080 ± 0. 0062 ＞
0. 5713 ± 0. 0187 $P > 0.05$
$P < 0.05$
$P < 0.05$
0. 5724 ± 0. 0152 ＞ 0. 5651 ± 0. 0156 ＞ 0. 5265 ± 0. 0176 ＞
0. 4054 ± 0. 0111 $P < 0.05$
$P > 0.05$

2

Table 2　Comparison of loadings of dominant pests to the first two principal components in different developing stages of jujube trees at the jujube fields of different treatments

Item		I		II		III	
		Y1	Y2	Y1	Y2	Y1	Y2
P1	A	0. 217 ± 0. 041c	− 0. 186 ± 0. 036c	0. 332 ± 0. 035b	0. 202 ± 0. 034c	0. 198 ± 0. 042b	0. 187 ± 0. 031b
	B	0. 283 ± 0. 028b	0. 295 ± 0. 027b	0. 352 ± 0. 023b	0. 306 ± 0. 029b	0. 220 ± 0. 019b	− 0. 201 ± 0. 052b
	C	0. 191 ± 0. 025c	0. 199 ± 0. 022c	− 0. 283 ± 0. 037c	− 0. 238 ± 0. 040c	0. 172 ± 0. 028b	0. 196 ± 0. 029b
	D	− 0. 344 ± 0. 032a	0. 353 ± 0. 023a	− 0. 457 ± 0. 042a	0. 372 ± 0. 030a	0. 354 ± 0. 033a	− 0. 274 ± 0. 021a
P2	A	− 0. 256 ± 0. 031c	0. 175 ± 0. 027c	–	–	–	–
	B	− 0. 319 ± 0. 022b	− 0. 266 ± 0. 043b	–	–	–	–
	C	− 0. 272 ± 0. 053c	0. 147 ± 0. 021c	–	–	–	–
	D	0. 379 ± 0. 041a	0. 312 ± 0. 033a	–	–	–	–
P3	A	0. 215 ± 0. 032c	− 0. 145 ± 0. 026c	0. 230 ± 0. 031b	− 0. 194 ± 0. 019c	0. 209 ± 0. 022b	− 0. 214 ± 0. 025bc
	B	0. 274 ± 0. 021b	0. 223 ± 0. 043b	0. 293 ± 0. 028b	− 0. 256 ± 0. 022b	0. 232 ± 0. 021b	− 0. 247 ± 0. 034b
	C	0. 226 ± 0. 031c	− 0. 158 ± 0. 023c	0. 276 ± 0. 025b	0. 248 ± 0. 043b	0. 218 ± 0. 032b	0. 187 ± 0. 066c
	D	0. 323 ± 0. 035a	0. 295 ± 0. 033a	0. 356 ± 0. 030a	0. 341 ± 0. 025a	0. 289 ± 0. 029a	− 0. 301 ± 0. 042a
P4	A	− 0. 255 ± 0. 021c	0. 145 ± 0. 032c	− 0. 182 ± 0. 025c	− 0. 184 ± 0. 030c	0. 212 ± 0. 024b	0. 173 ± 0. 041c
	B	− 0. 342 ± 0. 042b	0. 253 ± 0. 023b	− 0. 255 ± 0. 0019b	0. 242 ± 0. 041b	0. 224 ± 0. 023b	− 0. 234 ± 0. 021b
	C	0. 196 ± 0. 021d	− 0. 163 ± 0. 029c	0. 227 ± 0. 042bc	0. 217 ± 0. 032bc	0. 207 ± 0. 019b	0. 216 ± 0. 029bc
	D	− 0. 389 ± 0. 032a	− 0. 299 ± 0. 043a	− 0. 308 ± 0. 032a	− 0. 294 ± 0. 028a	0. 280 ± 0. 031a	− 0. 292 ± 0. 032a
P5	A	− 0. 199 ± 0. 033b	0. 162 ± 0. 021b	0. 232 ± 0. 031c	0. 192 ± 0. 022bc	0. 189 ± 0. 042c	0. 188 ± 0. 040c
	B	0. 208 ± 0. 042b	0. 180 ± 0. 043b	− 0. 252 ± 0. 025bc	− 0. 142 ± 0. 027c	0. 216 ± 0. 023bc	0. 153 ± 0. 020c
	C	0. 215 ± 0. 035b	− 0. 166 ± 0. 036b	0. 274 ± 0. 023b	− 0. 234 ± 0. 041b	0. 224 ± 0. 021b	− 0. 234 ± 0. 025b
	D	0. 274 ± 0. 030a	0. 299 ± 0. 043a	0. 343 ± 0. 025a	− 0. 294 ± 0. 030a	0. 288 ± 0. 026a	− 0. 297 ± 0. 034a
P6	A	–	–	0. 236 ± 0. 031c	0. 212 ± 0. 022bc	0. 179 ± 0. 012c	0. 179 ± 0. 022c
	B	–	–	− 0. 255 ± 0. 021bc	− 0. 232 ± 0. 021b	0. 166 ± 0. 013c	0. 196 ± 0. 024bc
	C	–	–	0. 270 ± 0. 033b	− 0. 194 ± 0. 041c	0. 204 ± 0. 021b	− 0. 234 ± 0. 035b
	D	–	–	0. 347 ± 0. 025a	− 0. 296 ± 0. 030a	0. 258 ± 0. 021a	− 0. 297 ± 0. 024a

Y1 1st principal component Y2 2nd principal component P₁ *Pseudococcus constocki* Kuwana P₂ *Scythropus yasumatsui* Kono et Morimto P₃ *Ancylis sativa* Liu P₄ *Tetranyehus cinnabarinus* Boisduval P₅ *Contarinia* sp. P₆ *Carposina niponensis* Walsingham the same below

3

Table 3　Comparison of loadings of dominant natural enemies to the first two principal components in different developing stages of jujube trees at the jujube fields of different treatments

Item		I		II		III	
		Y1	Y2	Y1	Y2	Y1	Y2
E_1	A	0.352 ± 0.054a	− 0.366 ± 0.042a	0.276 ± 0.032a	− 0.484 ± 0.021a	0.378 ± 0.049a	0.323 ± 0.032a
	B	0.264 ± 0.042bc	0.285 ± 0.040b	0.196 ± 0.028b	0.301 ± 0.043b	0.234 ± 0.032c	− 0.241 ± 0.027b
	C	0.298 ± 0.039b	0.319 ± 0.033b	− 0.224 ± 0.024b	0.326 ± 0.027b	0.287 ± 0.040b	0.316 ± 0.028a
	D	− 0.192 ± 0.032c	0.203 ± 0.061c	− 0.147 ± 0.019c	0.172 ± 0.053c	0.178 ± 0.042d	− 0.194 ± 0.023c
E_2	A	− 0.278 ± 0.038b	0.262 ± 0.028bc	− 0.292 ± 0.036b	0.318 ± 0.023b	0.331 ± 0.032a	0.301 ± 0.033a
	B	− 0.213 ± 0.027c	0.222 ± 0.046c	0.221 ± 0.046c	− 0.249 ± 0.032c	0.219 ± 0.027b	− 0.259 ± 0.021b
	C	− 0.384 ± 0.043a	0.332 ± 0.031a	0.372 ± 0.030a	0.373 ± 0.052a	0.349 ± 0.035a	0.318 ± 0.043a
	D	0.142 ± 0.031d	0.176 ± 0.036d	− 0.143 ± 0.024d	− 0.185 ± 0.035d	0.156 ± 0.040c	0.201 ± 0.024c
E_3	A	0.316 ± 0.019a	− 0.316 ± 0.022a	0.383 ± 0.023a	− 0.292 ± 0.034a	0.269 ± 0.032b	− 0.294 ± 0.024ab
	B	0.205 ± 0.026c	0.199 ± 0.040c	0.243 ± 0.043b	− 0.198 ± 0.029b	0.208 ± 0.022c	− 0.267 ± 0.026bc
	C	0.273 ± 0.041b	− 0.256 ± 0.023b	0.376 ± 0.035a	0.308 ± 0.024a	0.318 ± 0.032a	0.327 ± 0.031a
	D	0.162 ± 0.035d	0.135 ± 0.033d	0.156 ± 0.020c	0.143 ± 0.029c	0.146 ± 0.029d	− 0.201 ± 0.022c
E_4	A	0.391 ± 0.021a	0.219 ± 0.022b	− 0.347 ± 0.019b	− 0.285 ± 0.040b	0.333 ± 0.019b	0.316 ± 0.039b
	B	− 0.272 ± 0.032c	0.153 ± 0.033bc	− 0.253 ± 0.0031c	0.171 ± 0.031c	0.254 ± 0.033c	− 0.244 ± 0.021c
	C	− 0.356 ± 0.019b	0.275 ± 0.040a	0.425 ± 0.032a	0.352 ± 0.040a	0.402 ± 0.032a	0.373 ± 0.029a
	D	− 0.219 ± 0.026d	− 0.106 ± 0.023d	− 0.109 ± 0.042d	− 0.114 ± 0.028d	0.181 ± 0.021d	− 0.192 ± 0.022d
E_5	A	− 0.272 ± 0.033a	0.317 ± 0.021b	− 0.351 ± 0.021a	0.312 ± 0.032b	0.324 ± 0.024b	0.288 ± 0.041b
	B	0.212 ± 0.032b	0.262 ± 0.043c	0.274 ± 0.023b	− 0.242 ± 0.028c	0.266 ± 0.033c	0.191 ± 0.027c
	C	0.275 ± 0.042a	− 0.366 ± 0.026a	0.342 ± 0.035a	− 0.364 ± 0.019a	0.379 ± 0.042a	− 0.334 ± 0.023a
	D	0.165 ± 0.022c	0.199 ± 0.023d	0.212 ± 0.041c	− 0.196 ± 0.027d	0.218 ± 0.024d	− 0.147 ± 0.034d
E_6	A	− 0.372 ± 0.043a	0.347 ± 0.029a	0.373 ± 0.043a	0.292 ± 0.032a	0.254 ± 0.028a	0.248 ± 0.031b
	B	0.274 ± 0.042b	0.212 ± 0.023b	− 0.252 ± 0.021b	− 0.182 ± 0.021c	0.206 ± 0.033b	0.171 ± 0.020c
	C	0.375 ± 0.032a	− 0.366 ± 0.036a	0.333 ± 0.031a	− 0.234 ± 0.021b	0.279 ± 0.022a	− 0.294 ± 0.025a
	D	0.201 ± 0.032c	0.169 ± 0.023c	0.203 ± 0.025c	− 0.096 ± 0.017d	0.158 ± 0.021c	− 0.087 ± 0.014d

E_1　　　　*Inocellia* sp.　E_2　　　　*Chrysopa sinica* Tjeder　E_3　　　*Lasius fuliginosus* Latr.　E_4　　　　　*Typhladromus unlgaris* Ehata
E_5　　　*Lycosa sinensis* Schenkel　E_6　　　　*Erigonidium graminicolum*　Sundevall

4

Table 4　Comparison of breadth and overlapped parameter of two-dimensional temporal-spatial niches of dominant species of natural enemy and pests at the jujube fields of different treatments

A	E_1	E_2	E_3	E_3	E_5	E_6	P_1	P_2	P_3	P_4	P_5	P_6
E_1	0.778											
E_2	0.317	0.889										
E_3	0.462	0.465	0.867									
E_4	0.424	0.254	0.771	0.769								
E_5	0.392	0.380	0.652	0.722	0.879							
E_6	0.338	0.503	0.820	0.654	0.684	0.978						
P_1	0.565	0.566	0.673	0.832	0.791	0.473	0.894					
P_2	0.347	0.446	0.865	0.668	0.549	0.545	0.534	0.828				
P_3	0.363	0.352	0.533	0.392	0.463	0.634	0.532	0.614	0.926			
P_4	0.532	0.673	0.765	0.545	0.645	0.455	0.604	0.772	0.535	0.798		
P_5	0.474	0.485	0.638	0.853	0.385	0.636	0.768	0.513	0.635	0.661	0.892	

4

A	E_1	E_2	E_3	E_3	E_5	E_6	P_1	P_2	P_3	P_4	P_5	P_6
P_6	0.449	0.583	0.745	0.630	0.582	0.475	0.595	0.413	0.443	0.522	0.478	0.565
B	E_1	E_2	E_3	E_3	E_5	E_6	P_1	P_2	P_3	P_4	P_5	P_6
E_1	0.649											
E_2	0.356	0.736										
E_3	0.366	0.453	0.699									
E_4	0.474	0.587	0.558	0.687								
E_5	0.373	0.587	0.545	0.562	0.748							
E_6	0.224	0.551	0.811	0.463	0.682	0.729						
P_1	0.355	0.341	0.675	0.703	0.256	0.437	0.787					
P_2	0.416	0.442	0.743	0.639	0.641	0.554	0.358	0.799				
P_3	0.462	0.654	0.622	0.565	0.276	0.223	0.435	0.622	0.664			
P_4	0.369	0.557	0.652	0.567	0.473	0.547	0.254	0.535	0.474	0.785		
P_5	0.519	0.479	0.769	0.542	0.476	0.486	0.389	0.703	0.654	0.486	0.799	
P_6	0.489	0.511	0.752	0.621	0.632	0.510	0.376	0.654	0.567	0.524	0.364	0.685
C	E_1	E_2	E_3	E_3	E_5	E_6	P_1	P_2	P_3	P_4	P_5	P_6
E_1	0.879											
E_2	0.414	0.826										
E_3	0.323	0.561	0.983									
E_4	0.485	0.324	0.486	0.913								
E_5	0.334	0.463	0.754	0.565	0.897							
E_6	0.248	0.581	0.424	0.742	0.634	0.936						
P_1	0.142	0.472	0.948	0.664	0.367	0.756	0.765					
P_2	0.488	0.615	0.562	0.352	0.412	0.561	0.339	0.785				
P_3	0.423	0.472	0.844	0.563	0.326	0.435	0.561	0.336	0.869			
P_4	0.721	0.522	0.563	0.742	0.653	0.548	0.243	0.544	0.353	0.794		
P_5	0.438	0.625	0.732	0.528	0.774	0.643	0.324	0.535	0.249	0.449	0.898	
P_6	0.428	0.647	0.668	0.750	0.523	0.435	0.553	0.291	0.546	0.561	0.442	0.682
D	E_1	E_2	E_3	E_3	E_5	E_6	P_1	P_2	P_3	P_4	P_5	P_6
E_1	0.467											
E_2	0.152	0.657										
E_3	0.455	0.238	0.745									
E_4	0.386	0.353	0.461	0.534								
E_5	0.236	0.465	0.336	0.714	0.456							
E_6	0.233	0.586	0.663	0.625	0.641	0.569						
P_1	0.307	0.413	0.722	0.379	0.454	0.524	0.801					
P_2	0.493	0.256	0.246	0.482	0.535	0.327	0.323	0.768				
P_3	0.314	0.338	0.412	0.417	0.353	0.213	0.344	0.194	0.804			
P_4	0.566	0.262	0.576	0.335	0.472	0.376	0.227	0.456	0.348	0.687		
P_5	0.264	0.175	0.652	0.613	0.245	0.281	0.352	0.283	0.575	0.293	0.799	
P_6	0.318	0.482	0.431	0.472	0.442	0.448	0.434	0.429	0.295	0.459	0.481	0.760

2.4　　　　　　　　　　　　　　　　　　　　IPM

85%　　　　　　　　　　　89. 8% ± 0. 034%　　　　　87. 3% ± 0. 027%　　　　　　90. 4% ±
0. 040%　　　　96. 6% ± 0. 042%　　　　　　　85%　　　70%　　　　　　*Serica orientalis*
Motschulsky　　　　*Sucra jujube* Chu　　　　　*Asias halodendri*　Pallas　　　　　*Quadraspidiatus*
perniciosus Comstock
70%　　　　　　　　　　　　　　*P* < 0. 05
　　　P > 0. 05　　　　　　　　*P* < 0. 05
　　　　　　　　　85%　　　　　　　87. 7% ± 0. 032%　　　　86. 8% ± 0. 028%
85. 9% ± 0. 027%　　　　88. 1% ± 0. 034%　　　　　　85%　　70%　　　*Orius minutu*
L　　　*Syrphus nitens* Zetterstedt　　　*Chrysopa phyllochroma* Wesm　　　　*Propylaea japonica*
Thunberg　　　　　　　　　　　　　　　　　70%
　　P < 0. 05　　　　　　　　　　　　　　　　　　　　　　　　*P* > 0. 05
　　　　　　P < 0. 05

　　　　　　85%　　　　　　86. 4% ± 0. 029%　　　85. 7% ± 0. 044%
　　85. 9% ± 0. 037%　　　　85. 1% ± 0. 021%　　　87 8 ± 0. 019%
85%　　70%　　　　　*Ceroplastes japonicus* Green　　　　　　　*Cnidocampa flavescens*
Walker　　　　　　　　　　　　　70%　　　　*P* < 0. 05
　　　　　　　P > 0. 05　　　　　　　　　　85%
86. 9% ± 0. 022%　　　　85. 7% ± 0. 036%　　　87. 1% ± 0. 026%　　86. 0% ±
0. 026%　　　85. 9% ± 0. 043%　　　　*Stethorus punctillum* Weise
85%　　70%　　*Orius minutu* L　　　*Syrphus nitens* Zetterstedt　　　*Chrysopa phyllochroma*
Wesm　　*Propylaea japonica* Thunberg　　　　　*Clausenia purpuria* Ishii
Diaeretiella sp.　　　　　　70%　　　　*P* < 0. 05
　　　P > 0. 05

　　　　70%　　　　　*P* > 0. 05

　　　　　　　　　　　　　85%
　　　　91. 1% ± 0. 051%　　　　89. 8% ± 0. 024%　　　86. 4% ± 0. 034%
85. 6% ± 0. 028%　　　　85%　70%　　　*Ceroplastes japonicus* Green
　　Cassida sp.　　　　　　　　　70%　　　　　　　*P*
< 0. 05　　　　　　　　　　*P* > 0. 05
P < 0. 05　　　　　　　　　　85%
85. 0% ± 0. 033%　　　85. 2% ± 0. 026%　　　87. 4% ± 0. 024%　　88. 0% ±
0. 039%　　　85. 4% ± 0. 025%　　　85%　70%　　　*Megasty* sp.
　　Chelonus chinensis Zhang　　　　　　　　70%
　　P < 0. 05　　　　　　　　*P* < 0. 05

$$P > 0.05$$

4

17 – 19 21

IPM

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IPM

IPM

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Table 1   Comparison of community parameter of the pests and natural enemies at the jujube fields of different treatments

	Item	Pests				Natural enemies			
		A	B	C	D	A	B	C	D
I	Family	16 ± 0.416b	14 ± 0.429b	22 ± 0.374a	11 ± 0.328c	12 ± 0.555b	10 ± 0.525b	19 ± 0.641a	7 ± 0.726c
	Species	43 ±2.012b	35 ±3.257c	57 ±3.2633a	26 ±2.685d	25 ±0.572b	18 ±0.537c	32 ±0.922a	11 ±0.545d
	Abundance	435 ±19.31c	517 ±23.25b	464 ±18.28c	634 ±25.62a	152 ±15.59b	127 ±15.87c	195 ±11.24a	98 ±9.94d
	Diversity	3.154 ±0.326b	2.658 ±0.254c	3.981 ±0.268a	2.0645 ±0.321d	2.614 ±0.421b	2.012 ±0.3011c	2.989 ±0.3512a	1.766 ±0.2891d
	Evenness	0.728 ±0.053a	0.716 ±0.045a	0.821 ±0.058a	0.608 ±0.036b	0.812 ±0.108a	0.824 ±0.063a	0.795 ±0.114a	0.548 ±0.105b
	Dominance	0.199 ±0.024c	0.271 ±0.042b	0.203 ±0.036c	0.397 ±0.037a	0.263 ±0.078b	0.222 ±0.123c	0.294 ±0.063a	0.171 ±0.103d
II	Family	25 ± 0.955a	19 ± 0.755b	27 ± 0.773a	14 ± 0.567c	21 ± 0.644a	17 ± 0.755b	23 ± 0.574a	12 ± 0.666c
	Species	54 ±2.012b	43 ±3.257c	69 ±3.2633a	34 ±2.685d	41 ±0.895b	32 ±0.757c	53 ±0.772a	19 ±0.834d
	Abundance	574 ±35.42c	745 ±28.62b	597 ±27.88c	879 ±31.87a	225 ±35.79a	165 ±19.21b	237 ±32.89a	125 ±21.25c
	Diversity	2.987 ±0.371b	2.178 ±0.243c	3.594 ±0.254a	1.489 ±0.251d	2.752 ±0.421b	2.013 ±0.412c	3.218 ±0.362a	1.517 ±0.368d
	Evenness	0.826 ±0.062a	0.694 ±0.036b	0.879 ±0.054a	0.619 ±0.035c	0.942 ±0.215a	0.745 ±0.083b	0.923 ±0.062a	0.501 ±0.089c
	Dominance	0.225 ±0.025c	0.289 ±0.041b	0.236 ±0.033c	0.337 ±0.032a	0.298 ±0.037a	0.247 ±0.062b	0.317 ±0.046a	0.212 ±0.041c
III	Family	14 ± 0.847b	12 ± 0.546c	19 ± 0.595a	9 ± 0.575d	11 ± 0.653b	9 ± 0.443b	15 ± 0.695a	6 ± 0.675c
	Species	36 ±2.012b	32 ±3.257c	50 ±3.2633a	23 ±2.685d	18 ±0.975b	13 ±0.542c	26 ±0.893a	9 ±0.474d
	Abundance	418 ±19.43c	487 ±23.51b	423 ±32.21c	535 ±25.24a	113 ±32.84b	95 ±21.29c	149 ±38.28a	65 ±26.38d
	Diversity	2.983 ±0.178a	1.867 ±0.211c	2.547 ±0.271b	1.342 ±0.221d	2.693 ±0.342a	2.198 ±0.523b	2.879 ±0.361a	1.412 ±0.209c
	Evenness	0.827 ±0.051a	0.787 ±0.041a	0.899 ±0.064a	0.678 ±0.042b	0.798 ±0.036b	0.734 ±0.087c	0.842 ±0.035a	0.689 ±0.051d
	Dominance	0.223 ±0.031c	0.263 ±0.012b	0.232 ±0.031c	0.314 ±0.032a	0.284 ±0.042b	0.246 ±0.048c	0.338 ±0.062a	0.182 ±0.037d

I   3   10   ~5   20   Stage of sprouting and leaves of jujube tree   Mar. 10 May. 20   II   5   21   ~7   20   D Stage of blossom and young fruit of jujube tree May 21 Jul. 30   III   7   21   ~9   30   Stage of developing and ripening of jujube fruit   Aug. 1 Sept. 30   A   Integrated pest management jujube field intercropped with herbage   B   Conventional management jujube field intercropped with herbage   C   Non – management jujube field intercropped with herbage   D   Conventional management jujube field without herbage   The same below