AGRIOS'
PLANT
PATHOLOGY

SIXTH EDITION

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恭喜蔣國司老師的研究成果，
被收錄在植物病理學門的教科書最新版本。

TABLE 6.2 The Horsfall-Barratt (H-B) and the Chiang quantitative ordinal scales used as tools for assessing plant disease severity.

H-B Scale (1945)			Chiang et al. (2014)		
Ordinal equivalent	Severity (% range)	Midpoint	Ordinal equivalent	Severity (% range)	Midpoint
0	0	0	0	0	0
1	0^+–3	1.5	1	0^+–0.1	0.05
2	3^+–6	4.5	2	0.1^+–0.5	0.30
3	6^+–12	9.0	3	0.5^+–1.0	0.75
4	12^+–25	18.5	4	1.0^+–2.0	1.50
5	25^+–50	37.5	5	2.0^+–5.0	3.50
6	50^+–75	62.5	6	5.0^+–10.0	7.50
7	75^+–88	81.5	7	10.0^+–20.0	15.0
8	88^+–94	91.0	8	20.0^+–30.0	25.0
9	94^+–97	95.5	9	30.0^+–40.0	35.0
10	97^+–100	98.5	10	40.0^+–50.0	45.0
11	100	100	11	50.0^+–60.0	55.0
			12	60.0^+–70.0	65.0
			13	70.0^+–80.0	75.0
			14	80.0^+–90.0	85.0
			15	90.0^+–100.0	95.0

interval) linear increments at severity >10% resulted in more accurate estimates compared with the use of the H-B scale. One example is the "amended linear" scale with 16 intervals developed by Chiang and collaborators. The scale has nine grades with 10% intervals from 10 to 100, and 6 additional grades at <10%. The reason for including the additional grades is justified because raters tend to generally overestimate severity in that range (Table 6.2). The midpoints are presented in the table because these are the numbers used in the subsequent analysis of data to avoid bias of the mean values in replicated experiments.

Many diseases lend themselves to severity estimation using *ratio scales*. An example of a ratio scale is the percentage scale (0%–100%). A rater gauges the proportion of the organ showing symptoms and estimates the severity to the nearest percentage or fraction of a percentage. The estimate can be by one of two means: unaided or aided by standard area diagram sets (SADs). SADs are defined as a set of pictorial or graphic representations (drawing or true color photographs) of selected disease severities of plants or plant parts (leaves, fruit, flowers, etc.) (Fig. 6.5). The first diagrams were developed by Cobb (1892), but James popularized them in the 1970s when several dozens of SADs were developed. A rater uses the SADs as a guide for interpolation to provide a best estimate of the perceived severity of the specimen, not as a tool to classify the specimens as represented by the severities indicated in the SADs, or a preferred value. SADs have most often led to greater accuracy of estimates, especially for raters who are intrinsically less accurate and when small-sized lesions are numerous, with maximum severities less than 50%.

SAD research has evolved considerably since the early 2000s and several types of SAD illustrations have been prepared with the goal of providing images that mimic actual symptoms. Many of the SADs use actual photos of diseased specimens as diagrams. A curated list of more than 160 research articles on the development and validation of SADs can be found online (https://sadbank.netlify.app/).

Which scale should one use? There may be reasons for selecting any one of the types of scales used in plant pathology for a specific disease assessment purpose, but the user should remember that the objectivity and statistically available information content is least with the nominal