2006-027: DRAFT ANNEX to ISPM 27– *Sorghum halepense*

Comm. no.	Para. no.	Comment type	Comment	Explanation	Country	SC response
1.	*G*	Editorial	It is recommended that this protocol paragraphs are numbered for clarity and document management.	Clarify	Costa Rica	Noted. The IPPC Secretariat will adjust the formatting once the DP is adopted.
2.	*G*	Substantive	I support the document as it is and I have no comments		Georgia, Singapore, New Zealand, Nepal, Mexico, Congo, South Africa, Barbados, Bahrain, Guyana, Belize, Ghana, Burundi	Noted
3.	*G*	Technical	1.We would like to request the TPDP to include in this diagnostic protocol the uncertainty level of each method described in section 4, if available, in order to know their level of analytical confidence. We would also like the TPDP to consider the possibility to include a comparative table containing all methods with their uncertainty levels. 2.We suggest the TPDP to reflect in this DP that morphological identification of seeds should be complemented by the morphological identification of plants as diagnostic confirmation test. 3. QBOL is a consortium of 20 partners (universities, research institutes and phytosanitary organizations) from all over the world working together and sharing their research expertise in the field of DNA	See comment	Peru	1. Incorporate. A comparative table on each of identification method was included 2. Incorporated. Revision done to paragraph 29 3. Considered but not incorporated. However, we welcome to make more comments and suggestions

			barcoding of Arthropods, Bacteria, Fungi, Nematodes, Phytoplasmas and Viruses. Thereby, we would like to request the TPDP to evaluate the relevance to include this method in protocols.			
4.	*G*	Technical	1.We would like to request the TPDP to include in this diagnostic protocol the uncertainty level of each method described in section 4, if available, in order to know their level of analytical confidence. We would also like the TPDP to consider the possibility to include a comparative table containing all methods with their uncertainty levels. 2.We suggest the TPDP to reflect in this DP that morphological identification of seeds should be complemented by the morphological identification of plants as diagnostic confirmation test.	See comment	Argentina	1. Incorporated. See comment 3.2. Incorporated. See comment 3.
5.	*G*	Technical	1.We would like to request the TPDP to include in this diagnostic protocol the uncertainty level of each method described in section 4, if available, in order to know their level of analytical confidence. We would also like the TPDP to consider the possibility to include a comparative table containing all methods with their uncertainty levels. 2.We suggest the TPDP to reflect in this DP that morphological identification of seeds should be complemented by the morphological identification of plants as diagnostic confirmation test.	See comment	COSAVE	1. Incorporated. See comment 3. 2. Incorporated. See comment 3. 3. Considered but not incorporated. However, we welcome to make more comments and suggestions (see comment 3)
6.	*G*	Technical	1.We would like to request the TPDP to include in this diagnostic protocol the uncertainty level of each method described in section 4, if available, in order to know their level of analytical confidence. We would also like the TPDP to consider the possibility to include a comparative table containing all methods with their uncertainty levels.	See comment	Brazil	1. Incorporated. See comment 3. 2. Incorporated. See comment 3.

			2.We suggest the TPDP to reflect in this DP that morphological identification of seeds should be complemented by the morphological identification of plants as diagnostic confirmation test. 3. QBOL is a consortium of 20 partners (universities, research institutes and phytosanitary organizations) from all over the world working together and sharing their research expertise in field of DNA barcoding of Arthropods, Bacteria, Fungi, Nematodes, Phytoplasmas and Virus. Thereby, we would like to request the TPDP to evaluate the relevance to include this method in this protocol.			3. Considered but not incorporated. However, we welcome to make more comments and suggestions (see comment 3)
5.	*G*	Technical	1. We would like to request the TPDP to include in this diagnostic protocol the uncertainty level of each method described in section 4, if available, in order to know their level of analytical confidence. We would also like the TPDP to consider the possibility to include a comparative table containing all methods with their uncertainty levels. 2. We suggest the TPDP to reflect in this DP that morphological identification of seeds should be complemented by the morphological identification of plants as diagnostic confirmation test.	See comment	Uruguay, Chile, Paraguay	1. Incorporated. See comment 3. 2. Incorporated. See comment 3.
8.	*8*	Substantive	**1. Pest Information**	Reference to essential reviews on this pest are missing, e.g. Warwick et al. (1993) Canadian Journal of Plant Science 63: 997-1014.	EPPO	Incorporated. Referred to it, improved the description
9.	*8*	Substantive	**1. Pest Information** Include information on seed description.	It would be helpful to include a brief description of the seed, including seed size under pest information. This will provide context for ‘Section 3.2. Sieve detection’.	Australia	Incorporated. Referred to it, improved the description
10.	*8*	Substantive	**1. Pest Information**	References to essential reviews on this pest are missing, e.g. Warwick&Black (1983) Canadian Journal of Plant Science 63: 997-	European Union	Incorporated.

				1014; Follak&Essl (2012) Weed Research 53(1):53-60.		
11.	9	Editorial	*Sorghum halepense* (Johnsongrass) is a perennial grass with a ribbed leaf sheath, conspicuous midrib, large, purplish panicles, and far-reaching rhizomes (Figures 1 and 2[no space between]). It originated from the hybridization of *Sorghum arundinaceum* and *Sorghum propinquum* through chromosome doubling (chromosomes: 2n = 4x = 40) (Ng'uni et al., 2010). *S. halepense*which is native to the Mediterranean area (Meredith, 1955) and was introduced to India in the late 1960s (Bor, 1960). It has become widespread, and is distributed from latitude 55° north to 45° south. It is best adapted to warm, humid areas with summer rainfall, areas with a high water table, and irrigated fields in subtropical zones. *S. halepense* is one of the most malignant weeds worldwide, impacting more than 30 cereal, vegetable and fruit crops (Holm *et al.*, 1977). It also threatens biodiversity in invaded habitats in no fewer than 50 countries in temperate and tropical areas throughout the world, including countries in which it is a native species (Holm *et al.*, 1977).	grammatical correction	Kenya	Incorporated.
12.	9	Substantive	*Sorghum halepense* (Johnsongrass) is a perennial grass with a ribbed leaf sheath, conspicuous midrib, large, purplish panicles, and far-reaching rhizomes (Figures 1 and 2-). Its origin is uncertain, some authors suggest that it originated from the hybridization of *Sorghum arundinaceum* and *Sorghum propinquum* through chromosome doubling (chromosomes: 2n = 4x = 40) (Ng'uni et al., 2010). *S. halepense* which is native to the Mediterranean area (Meredith, 1955) and was introduced to India in the late 1960s (Bor, 1960). It has become widespread, and is distributed from latitude 55° north to 45° south. It is best adapted to warm, humid	the origin of S. halepense is not as clear as suggested here. Another possibility supported by the cited study and Morden et al. 1990 is that one of the parent of Sorghum halepense is Sorghum bicolor. It could be useful to give precisions (citing references)-: which habitats are concerned and where does this impact occur?	EPPO	1. Modified. 2. Modified. The mention to "in invaded habitats" has been removed from the text. However, the reference to Holm et al., 1997 remains.

			areas with summer rainfall, areas with a high water table, and irrigated fields in subtropical zones. *S. halepense* is one of the most malignant weeds worldwide, impacting more than 30 cereal, vegetable and fruit crops (Holm *et al.*, 1977). It also threatens biodiversity in invaded habitats (which ones and how) in no fewer than 50 countries in temperate and tropical areas throughout the world, including countries in which it is a native species (Holm *et al.*, 1977).			
13.	9	Substantive	*Sorghum halepense* (Johnsongrass) is a perennial grass with a ribbed leaf sheath, conspicuous midrib, large, purplish panicles, and far-reaching rhizomes (Figures 1 and 2). Its origin is uncertain, some authors suggest that it originated from the hybridization of *Sorghum arundinaceum* and *Sorghum propinquum* through chromosome doubling (chromosomes: 2n = 4x = 40) (Ng'uni et al., 2010). *S. halepense*which is native to the Mediterranean area (Meredith, 1955) and was introduced to India in the late 1960s (Bor, 1960). It has become widespread, and is distributed from latitude 55° north to 45° south. It is best adapted to warm, humid areas with summer rainfall, areas with a high water table, and irrigated fields in subtropical zones. *S. halepense* is one of the most malignant weeds worldwide, impacting more than 30 cereal, vegetable and fruit crops (Holm *et al.*, 1977). It also threatens biodiversity in invaded habitats (which ones and how) in no fewer than 50 countries in temperate and tropical areas throughout the world, including countries in which it is a native species (Holm *et al.*, 1977).	The origin of S. halepense is not as clear as suggested here. Another possibility supported by the cited study and Morden et al. 1990 is that one of the parents of Sorghum halepense is Sorghum bicolor. It could be useful to give precisions (citing references) : which habitats are concerned and where does this impact occur?	European Union	Modified. See response above (comment 12)
14.	9	Technical	*Sorghum halepense* (Johnsongrass) is a perennial grass with a ribbed leaf sheath, conspicuous midrib, large, purplish panicles, and far-reaching rhizomes (Figures 1 and 2). It originated from the hybridization of *Sorghum arundinaceum* and	it is a bit strange to focus on India here since the species has become established in all the warm regions of the world as explained in the next sentence. Either	EPPO	Incorporated (Modified). Text adjusted to "other regions then"

			Sorghum propinquum through chromosome doubling (chromosomes: 2n = 4x = 40) (Ng'uni et al., 2010). *S. halepense*which is native to the Mediterranean area (Meredith, 1955) and was introduced to India in the late 1960s (Bor, 1960). It has become widespread, and is distributed from latitude 55° north to 45° south. It is best adapted to warm, humid areas with summer rainfall, areas with a high water table, and irrigated fields in subtropical zones. *S. halepense* is one of the most malignant weeds worldwide, impacting more than 30 cereal, vegetable and fruit crops (Holm *et al.*, 1977). It also threatens biodiversity in invaded habitats in no fewer than 50 countries in temperate and tropical areas throughout the world, including countries in which it is a native species (Holm *et al.*, 1977).	remove India or give other countries and dates of introduction.		
15.	9	Technical	*Sorghum halepense* (Johnsongrass) is a perennial grass with a ribbed leaf sheath, conspicuous midrib, large, purplish panicles, and far-reaching rhizomes (Figures 1 and 2). It originated from the hybridization of *Sorghum arundinaceum* and *Sorghum propinquum* through chromosome doubling (chromosomes: 2n = 4x = 40) (Ng'uni et al., 2010). *S. halepense*which is native to the Mediterranean area (Meredith, 1955) and was introduced to India in the late 1960s (Bor, 1960). It has become widespread, and is distributed from latitude 55° north to 45° south. It is best adapted to warm, humid areas with summer rainfall, areas with a high water table, and irrigated fields in subtropical zones. *S. halepense* is one of the most malignant weeds worldwide, impacting more than 30 cereal, vegetable and fruit crops (Holm *et al.*, 1977). It also threatens	It is a bit strange to focus on India here since the species has become established in all the warm regions of the world as explained in the next sentence. Either remove India or give other countries and dates of introduction.	European Union	Incorporated (Modified). Text adjusted "other regions then" (see response above – comment 14)

			biodiversity in invaded habitats in no fewer than 50 countries in temperate and tropical areas throughout the world, including countries in which it is a native species (Holm *et al.*, 1977).			
16.	*10*	Editorial	The main factors affecting the pest risk of *S. halepense* are that it: (1) has a high reproductive capacity; (2) is an alternate host of numerous pathogen species; (3) ~~has allelopathic effects in and toxicity to livestock (da Nobrega *et al.*, 2006); (4)~~ has developed resistance to a wide range of herbicide groups (Heap, n.d.); and (4~~5~~) crosses with related species readily, which may produce more invasive hybrids and cause gene pollution of crop species (Arriola and Ellstrand, 1996).	Deltion of point (3): Is it normal/acceptable to make a direct reference to an animal health benefit in an ISPM?	EPPO	Considered, but not incorporated. This section is "Pest information" and *S. halepense* is known for its potential toxicity in livestock, which is related to food security, even though not directly related to IPPC mission (i.e. livestock). The pest risk, in general sense, is caused by its potential harmfulness. Here toxicity to livestock is one of the harmful factors of *S. halepense*
17.	*10*	Editorial	The main factors affecting the pest risk of *S. halepense* are that it: (1) has a high reproductive capacity; (2) is an alternate host of numerous pathogen species; (3) ~~has allelopathic effects in and toxicity to livestock (da Nobrega *et al.*, 2006); (4)~~ has developed resistance to a wide range of herbicide groups (Heap, n.d.); and (4~~5~~) crosses with related species readily, which may produce more invasive hybrids and cause gene pollution of crop species (Arriola and Ellstrand, 1996).species (Arriola and Ellstrand, 1996).	Deletion of point (3): Is it normal/acceptable to make a direct reference to an animal health benefit in an ISPM?	European Union	Considered, but not incorporated. See response above (comment 16).
18.	*10*	Substantive	The main factors affecting the pest risk of *S. halepense* are that it: (1) has a high reproductive capacity and the seeds have the characteristic of dormancy; (2)The Sorghum halepense has strong competition ability and cause great yield lost of crop;(3) is an alternate host of numerous pathogen	The inference ability and seed dormancy of weed are important factors deciding its harmful level and environmental fitness.	China	Modified.

			species; (34) has allelopathic effects in and toxicity to livestock (da Nobrega *et al*., 2006); (45) has developed resistance to a wide range of herbicide groups (Heap, n.d.); and (56) crosses with related species readily, which may produce more invasive hybrids and cause gene pollution of crop species (Arriola and Ellstrand, 1996).			
19.	*10*	Substantive	The main factors affecting the pest risk of *S. halepense* are that it: (1) has a high reproductive capacity; (2) is an alternate host of numerous pathogen species; (3) has allelopathic effects in and toxicity to livestock (da Nobrega *et al*., 2006); (4) has developed resistance to a wide range of herbicide groups (Heap, n.d.); and (5) crosses with related species readily, which may produce more invasive hybrids and cause gene pollution of crop species (Arriola and Ellstrand, 1996).	Suggest substituting the term "gene pollution" with "gene introgression" (stable transfer of genetic material from one species/variety/population to another). This process is well known within the genus Sorghum (commercial sorghum, Johnson grass, shatter cane, and others). Indeed, genetic material is transferred between commercial sorghum and Johnson grass (in both directions).	United States of America	Incorporated.
20.	*10*	Technical	The main factors affecting the pest risk of *S. halepense* are that it: (1) has a high reproductive capacity; (2) is an alternate host of numerous pathogen species; (3) has allelopathic effects in and toxicity to livestock (da Nobrega *et al*., 2006); (4) has developed resistance to a wide range of herbicide groups (Heap, n.d.); and (5) readily crosses with related species (including crop species) readily, which may result in produce more invasive hybrids or and cause gene pollution of crop species (Arriola and Ellstrand, 1996).	Improvements to the English and highlighting that direct hybridisation with crop species is a risk.	EPPO, European Union	Modified. Text revised, but it doesn't need to extend of fix the range of related species because it is mentioned in the later sentence,
21.	*10*	Technical	The main factors affecting the pest risk of S. halepense are that it: (1) has a high reproductive capacity; (2) is an alternate host of numerous pathogen species; (3) has allelopathic effects in and toxicity to livestock (da Nobrega et al., 2006); (4) has developed resistance to a wide range of herbicide groups (Heap, n.d.); and (5) crosses with related species readily, which may produce more invasive hybrids and cause gene pollution of crop species (Arriola and Ellstrand, 1996).	Toxicity to livestock is not a factor affecting the pest risk. According to section 2.3.1. of ISPM 11 consequences considered should result from effects on plants.	COSAVE, Argentina, Peru, Brazil, Uruguay,	Considered but not incorporated. (See response to comment 16).

22.	*11*	Editorial	S. halepense is able to reproduce by rhizomes or seeds. ~~Fragments of its long, vigorous and highly adaptable~~ Rhizomes ~~rhizome system~~ readily sprout and can be distributed by tillage. An individual S. halepense plant is able to produce as many as 28 000 seeds in a growing season. These seeds are able to survive and germinate under most environmental conditions. ~~Seed reproduction may generate diverse ecotypes that are distinct in morphology, anatomy and physiology.~~	1) simplifiction of the English 2) Unnecessary wording. This is fairly basic biology and is applicable to any seed so does it really warrant specific mention?	EPPO	Modified.
23.	*11*	Editorial	*S. halepense* is able to reproduce by rhizomes or seeds. ~~Fragments of its long, vigorous and highly adaptable~~ Rhizomes ~~rhizome system~~ readily sprout and can be distributed by tillage. An individual *S. halepense* plant is able to produce as many as 28 000 seeds in a growing season. These seeds are able to survive and germinate under most environmental conditions. ~~Seed reproduction may generate diverse ecotypes that are distinct in morphology, anatomy and physiology.~~	1) Simplification of the English 2) Unnecessary wording. This is fairly basic biology and is applicable to any seed so does it really warrant specific mention?	European Union	Modified.
24.	*12*	Editorial	Seeds are the main means of spread of *S. halepense*, and they are readily distributed by wind and water as well as by birds and other animals. More importantly, ~~the~~ seeds are frequently disseminated as a contaminant of commodities traded around the world; in particular, crop seeds and raw grains, such as *Sorghum bicolor* (sorghum), *Glycine max* (soybean), *Zea mays* (maize), *Triticum aestivum* (wheat) and *Sesamum indicum* (sesame), as well as forage, *Gossypium* spp. (cotton) and birdseed mixes. Therefore, seed quarantine is key ~~the core task~~ for the control of *S. halepense*, and ~~which~~ requires ~~the prerequisite of~~ accurate detection and identification of seeds.	Improved clarity.	EPPO, European Union	Modified.
25.	*12*	Technical	~~Seeds are the main means of spread of *S. halepense*, and they are readily distributed by wind and water as~~	This paragraph is not related to pest identification and additionally may lead to	COSAVE,	Modified.

			~~well as by birds and other animals. More importantly, the seeds are frequently disseminated as a contaminant of commodities traded around the world; in particular, crop seeds and raw grains, such as *Sorghum bicolor* (sorghum), *Glycine max* (soybean), *Zea mays* (maize), *Triticum aestivum* (wheat) and *Sesamum*~~ *indicum* (sesame), as well as forage, *Gossypium* spp. ~~(cotton) and birdseed mixes. Therefore, seed quarantine is the core task for the control of *S. halepense*, which requires the prerequisite of accurate detection and identification.~~	the idea that it will be always necessary to establish measures for this pest even without an appropriate technical justification.	Argentina, Peru, Brazil, Urugua, Chile, Paraguay	This paragraph was kept with modification to the last sentence. This paragraph is the prerequisite for developing this diagnostic protocol. The last sentence was removed as it was too directive to NPPOs.
26.	*15*	Editorial	**Synonyms:** *Holcus halepensis* L., 1753	Put the synonyms in alphabetical order unless there is a specific reason why they are not already (e.g. by how commonly they are used.)	EPPO, European Union	Modified
27.	*16*	Technical	~~*Sorghum miliaceum* (Roxb.) Snowden, 1955~~	Sorghum miliaceum is not a synonym of Sorghum halepense. In fact, they are different species.	Thailand	Incorporated
28.	*17*	Technical	~~*Andropogon miliaceus* Roxb., 1820~~	Andropogon miliaceus is not a synonym of Sorghum halepense. In fact, they are different species. Andropogon miliaceus is a synonym of Sorghum miliaceum.	Thailand	Incorporated
29.	*18*	Technical	~~*Sorghum controversum* (Steud.) Snowden, 1955~~	Sorghum controversum is not a synonym of Sorghum halepense. In fact, they are different species.	Thailand	Incorporated
30.	*19*	Technical	~~*Andropogon controversus* Steud., 1854~~	Andropogon controversus is not a synonym of Sorghum halepense. In fact, they are different species. Andropogon controversus is a synonym of Sorghum controversum.	Thailand	Incorporated
31.	*29*	Editorial	Identification of *S. halepense* is commonly based on morphology. For suspected seeds with intact glumes and upper lemmas, morphological identification methods (section 4.1) are reliable. However, the fruits and seeds collected may be incomplete and	Editorial correction.	COSAVE, Argentia, Peru, Brazil, Uruguay,	Modified.

<table>
<tr><td></td><td></td><td></td><td>parts of their characters unclear. In such cases, molecular (section 4.2) or biochemical (section 4.3) identification methods may need to be used. Seeds may also be sown and grown into seedlings and then mature plants ~~that~~ can be morphologically (section 4.4) or cytologically (section 4.5) examined for taxonomic traits and subsequently identified. Figure 4 presents a flow diagram for the identification of S. halepense.</td><td></td><td>Chile, Paraguay</td><td></td></tr>
<tr><td>32.</td><td>30</td><td>Editorial</td><td>S. halepense is prone to be confused with five related species in the genus Sorghum:</td><td>Put the five species into alphabetical order unless there is a specific reason why they are not already.</td><td>EPPO, European Union</td><td>Incorporated</td></tr>
<tr><td>33.</td><td>41</td><td>Editorial</td><td>
<table>
<tr><th>Species</th><th>Sessile spikelet</th><th>Caryopsis</th><th>Weight of 1 000 seeds (g, approximate)</th></tr>
<tr><td>S. halepense</td><td>Oval, (3.8) 4–5 (6.5~~5.6~~) mm in length, appressed pubescent</td><td>Dark brown, obovate, 2.6–3.2 mm in length and 1.5–1.8 mm in width</td><td>4.9</td></tr>
<tr><td>S. × almum</td><td>Oval to oblong, 4.5–6 mm in length, short pubescent</td><td>Red–brown, broadly ovate or oval, 3.3–4 mm in length and 2–2.3 mm in width</td><td>6.6</td></tr>
<tr><td>S. propinquum</td><td>Oval to oblong , 3.8–4.5 mm in length, bearded</td><td>Brown, broadly ovate or broadly oval, approximately 2 mm in length and 1.5 mm in width</td><td>3.8</td></tr>
<tr><td>S. sudanense</td><td>Oval, (5) 6–8 mm in length, sparsely pubescent</td><td>Red–brown, broadly ovate, 3.5–4.5 mm in length, 2.5–2.8 mm in width</td><td>10–15</td></tr>
</table>
</td><td>According to the Barkworth, M.E. (2013), sessile

spikelet bisexual is 3.8-6.5 mm long, 1.5-2.3 mm wide.</td><td>Japan</td><td>Incorporated</td></tr>
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<table>
<tr><td>S. bicolor</td><td>Elliptic to oblongor ovate, (3) 4.5– 6 (9) mm in length, densely hispid, or pubescent to glabrous</td><td>Pink to red–brown, ovate, 3.5–4 mm in length, 2.5–3 mm in width</td><td>>20</td></tr>
<tr><td>Sorghum spp. hybrid cv. Silk</td><td>Oval, approximately 3.8 mm in length, short pubescent</td><td>Yellow or yellow–brown, broadly ovate, 2.5–4 mm in length and 1.7–2.5 mm in width</td><td>4.2</td></tr>
</table>
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<tr>
<td>34.</td>
<td>41</td>
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<td>
<table>
<tr><th>Species</th><th>Sessile spikelet</th><th>Caryopsis</th><th>Weight of 1 000 seeds (g, approximate)</th></tr>
<tr><td>S. halepense</td><td>~~Oval~~elliptic or ovate, (3.8) 4–

5 (5.6) mm in length, appressed pubescent</td><td>Dark brown, obovate to elliptic,

2.6–3.2 mm in length and 1.5–1.8 mm in width</td><td>4.9</td></tr>
<tr><td></td><td>elliptic to oblong~~Oval to oblong,~~ 4.5–</td><td>Red–brown, broadly ovate or</td><td></td></tr>
</table>
</td>
<td>Oval means the width over one-half of the length. Based on the samples and pictures of S. halepense, also based on some relative references(Flora of China Editorial Committee. 2013. Poaceae Flora of China, 22 URL: http://foc.eflora.cn/content.aspx?TaxonId=130722), the sessile spikelet of S. halepense is not oval in most cases. For the same reasons, some morphological descriptions of other species ere been suggested to confirm and revise.</td>
<td>China</td>
<td>Incorporated. In addition, revised description on sessile spikelet because based on “Flora of China” it is elliptic</td>
</tr>
</table>

			S. × almum | 6 mm in length, short pubescent | oval, 3.3– 4 mm in length and 2–2.3 mm in width | 6.6			
			S. propinquum | elliptic to oblongOval to oblong , 3.8– 4.5 mm in length, bearded | Brown, broadly ovate or broadly oval, approximately 2 mm in length and 1.5 mm in width | 3.8			
			S. sudanense | Oval, (5) 6– 8 mm in length, sparsely pubescent | Red–brown, broadly ovate, 3.5–4.5 mm in length, 2.5–2.8 mm in width | 10–15			
			S. bicolor | Elliptic to oblongor ovate, (3) 4.5– 6 (9) mm in length, densely hispid, or pubescent to glabrous | Pink to red–brown, ovate, 3.5–4 mm in length, 2.5–3 mm in width | >20			
			Sorghum spp. hybrid cv. Silk | Oval, approximately 3.8 mm in | Yellow or yellow–brown, broadly ovate, 2.5–4 mm in length and 1.7– | 4.2			

<table>
<tr><td></td><td></td><td></td><td><table><tr><td></td><td>length, short pubescent</td><td>2.5 mm in width</td><td></td></tr></table></td><td></td><td></td><td></td></tr>
<tr><td>35.</td><td>41</td><td>Technical</td><td><table>
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<tr><td>S. propinquum</td><td>Oval to oblong, 3.8–54.5 mm in length, bearded</td><td>Brown, broadly ovate or broadly oval, approximately 2 mm in length and 1.5 mm in width</td><td>3.8</td></tr>
<tr><td>S. sudanense</td><td>Oval, (5) 6–8 mm in length, sparsely pubescent</td><td>Red–brown, broadly ovate, 3.5–4.5 mm in length, 2.5–2.8 mm in width</td><td>10–15</td></tr>
</table></td><td>For sessile spikelet, it would be useful to provide length and width. According to Flora of North America, the length of sessile spikelet for S. halapense can reach 6.5 mm. For S. x almum, S. propinquum and S. bicolor, Clayton et al. (2006) provide higher value. Clayton, W.D., Vorontsova, M.S., Harman, K.T. and Williamson,

H. (2006 onwards). GrassBase - The Online World Grass Flora. http://www.kew.org/data/grasses-db.html.</td><td>EPPO, European Union</td><td>Incorporated</td></tr>
</table>

			S. bicolor | Elliptic to oblongor ovate (3) 4.5–6 (109) mm in length, sparsely pubescent, densely hispid, or pubescent to glabrous | Pink to red–brown, ovate, 3.5–4 mm in length, 2.5–3 mm in width | >20 *Sorghum* spp. hybrid cv. Silk | Oval, approximately 3.8 mm in length, short pubescent | Yellow or yellow–brown, broadly ovate, 2.5–4 mm in length and 1.7–2.5 mm in width | 4.2			
36.	*44*	Technical	Glume | **Lower glume** | **Upper glume** | **Upper lemma** *S. halepense* | Subleathery~~Leathery~~, tawny, red–brown, or purple–black | Apex clearly tridenticulat e, 5–7-veined, dorsum ciliary but the rest glabrous | 3-veined | Triangular lanceolate, apex bilobed and awned or not; awn 10–16 mm *S. × almum* | Chartaceou s or subleathery, dark brown | Apex little tridenticulat e, 5–7-veined, dorsum ciliary but the rest glabrous | 3-veined | Lanceolat e, apex obtuse or slightly acute, bilobed,awned; awn approximately 15 mm	The glume of S. halepense is subleathery. And the upper lemma of S. sudanense is ovate or elliptic. Based on some relative references(Flora of China Editorial Committee. 2013. Poaceae Flora of China, 22 URL: http://foc.eflora.cn/content.aspx?TaxonId=130722), some morphological descriptions of the two species ere suggested to confirm and revise.	China	Incorporated

S. prop inquum	Subleath er y, dark brown with inconspic u ous crossvein s	9–11- veined, apex acute to apiculate or tridenticul at e, pubescent	7-veined	Lanceolat e, approxima tely 3.5 mm in length, acute or emarginat e, awnless
S. suda nense	Leathery, lemon yellow to red–brown	Apex bidenticula t e, 11–13- veined, usually with crossveins , dorsum short ciliary	5–7- veined, with crossvei ns	ovate or ellptic~~Ovat e or oval~~, apex bilobed, awned; awn 10– 16 mm
S. bicol or	Leathery, pink to red–brown	Apex acute or tridenticul at e, 12–16- veined with crossveins, dorsum dense ciliary	7–9- veined	Lanceolat e to long oval, 2–4- veined, apex bilobed, awned; awn approxima tely 1 mm
Sorghu m spp. hybrid cv. Silk	Leathery, tawny, red–brown or purple–black	Apex little tridenticul at e, 5–7- veined, dorsum ciliary but	3-veined	Broad lanceolate, apex slightly bilobed, awnless

37.	60	Editorial	In this diagnostic protocol, methods (including	Delete unnecessary brackets	Canada	Incorporated/Modified.

			reference to brand names) are described as published, as these defined the original level of sensitivity, specificity and/or reproducibility achieved. The use of names of reagents, chemicals or equipment in these diagnostic protocols implies no approval of them to the exclusion of others that may also be suitable. (This information is given for the convenience of users of this protocol and does not constitute an endorsement by the CPM of the chemical, reagent and/or equipment named~~.)~~. Laboratory procedures presented in the protocols may be adjusted to the standards of individual laboratories, provided that they are adequately validated.			Disclaimer adjusted to the standard text in all diagnostic protocols.
38.	*60*	Technical	In this diagnostic protocol, methods (including reference to brand names) are described as published, as these defined the original level of sensitivity, specificity and/or reproducibility achieved. The use of names of reagents, chemicals or equipment in these diagnostic protocols implies no approval of them to the exclusion of others that may also be suitable. (This information is given for the convenience of users of this protocol and does not constitute an endorsement by the CPM of the chemical, reagent and/or equipment named.). Laboratory procedures presented in the protocols may be adjusted to the standards of individual laboratories, provided that they are adequately validated. Under certain circumstances, seedling from seed samples may also be used to extract DNA	If there is only a small number of seeds and they are vigorous, the quality of DNA exctracted from seedlings is relatively higer than only from seeds.	China	Modified. According to instructions to authors and agreement by the SC (and the according to the recent adopted DPs), this disclaimer is in the main text and in footnotes (if a brand name in the protocol). However, the suggestion was incorporated in paragraph 62 (section "4.2.1 Methods based on DNA markers")
39.	*60*	Technical	In this diagnostic protocol, methods (including reference to brand names) are described as published, as these defined the original level of sensitivity, specificity and/or reproducibility achieved. ~~The use of names of reagents, chemicals or equipment in these diagnostic protocols implies no approval of them to the exclusion of others that may also be suitable. (This information is given for the convenience of users of this protocol and does not constitute an endorsement by the CPM of the~~	Texted deleted and included in the footnote as previously agreed.	COSAVE, Argentina, Peru, Brazil, Uruguay, Chile, Paraguay	Modified. According to instructions to authors and agreement by the SC (and according to the recent adopted DPs), this disclaimer is in the main text and in footnotes (if a brand name in the protocol).

			~~chemical, reagent and/or equipment named.).~~ Laboratory procedures presented in the protocols may be adjusted to the standards of individual laboratories, provided that they are adequately validated.			
40.	*62*	Substantive	For DNA extraction from seed samples, refer to the source paper of the molecular method for the specific technique used (Chen et al., 2009). The method described by Moller *et al.* (1992) is recommended for DNA microextraction from seeds of *Sorghum* species. Laboratories may find that alternative DNA extraction techniques work equally well. If more than one seed is included in the extraction, the DNA may comprise a mixture of species. Note: it would be better if there are recommended protocol for DNA extraction for this guidelines	if it is possible, it would be better if there are included recommended method for DNA extraction, for guidelines to conduct appropriate DNA extraction especially for this species	Indonesia	Modified. The DP refers to literature DNA extraction methods. A footnote was included to mention that Laboratories may find that alternative DNA extraction techniques work equally well
41.	*106*	Technical	**4.4 Morphological identification of plants**	It would be useful to have some estimated timeframes	Australia	Incorporated. Added "for more than 100 days" in which seeds can be grown.
42.	*110*	Technical	**Mature plant:** Perennial with vigorous, spreading rhizomes. Culms 0.5–1.5 (–3~~2~~.0) m tall, 4–6 (–20) mm in diameter; nodes puberulous. Leaf sheaths glabrous; leaf blades linear or linear-lanceolate, (10–) 25–80 (– 90) × (0.5~~8~~–) 1–4 cm, glabrous; ligule 0.5–1 (2–6) mm, glabrous ciliolate membrane.	Change of mimum or maximum size acoording to Clayton et al. (2006).	EPPO	Incorporated.
43.	*110*	Technical	**Mature plant:** Perennial with vigorous, spreading rhizomes. Culms 0.5–1.5 (–3~~2~~.0) m tall, 4–6 (–20) mm in diameter; nodes puberulous. Leaf sheaths glabrous; leaf blades linear or linear-lanceolate,	Change of mimum or maximum size acoording to Clayton et al. (2006).	European Union	Incorporated.

			(10–) 25–80 (– 90) × (0.58–) 1–4 cm, glabrous; ligule 0.5–1 (2–6) mm, glabrous ciliolate membrane.			
44.	*111*	Technical	**Inflorescence:** Panicle lanceolate to pyramidal in outline,.(10–) 20–40 (–550) cm, soft white hairs in basal axil; primary branches solitary or whorled, spreading, lower part bare, upper part branched, the secondary branches tipped by racemes; racemes fragile, composed of (1–) 2–5 spikelet pairs.	Maximum size changed according to Clayton et al (2006)	EPPO, European Union	Incorporated.
45.	*112*	Technical	**Spikelet:** Usually in pairs although towards the tip of the inflorescence they may occur in threes; when the spikelet is in pairs, the lower is sessile and perfect with the upper, pedicelled, narrow, long and stamen-bearing; when the spikelet is in threes, one is sessile and perfect, the others are pedicelled and staminate. Sessile spikelet elliptic, (3.8–) 4–5 (–6.5) mm; callus obtuse, bearded; subleathery lower glume leathery, often pale yellow or yellowish brown at maturity, shortly pubescent or glabrescent, 5–7-veined, veins distinct in upper part, apex tridenticulate; upper lemma acute and mucronate or bilobed and awned or not; awn 1–1.6 cm. Pedicelled spikelet staminate, narrowly lanceolate, (3.6–) 4.5–7 mm, often violet-purple.	The glume of S. halepense is subleathery.	China	Incorporated.
46.	*119*	Substantive	– Culm base 3–9 mm in diameter ***S. sudanense***	Sorghum bicolor subsp. arundinaceum (Desv.) de Wet & J.R. Harlan should be included in the key.	EPPO, European Union	Considered, but not incorporated. Sorghum bicolor subsp. arundinaceum (Desv.) de Wet & J.R. Harlan is a wild species in Sorghum and has a limited distribution range. So it may not be often found in traded commodities The key is for the five main

						species that are referred to elsewhere in the DP. (i.e. it does not cover all potentially confusing species.)
47.	*145*	Technical	The mean fluorescence of nuclei is quantified using a flow cytometer (Coulter Electronics)[1] equipped with a water- cooled laser tuned at 514 nm and 500 mW. Fluorescence at >615 nm is detected with a photomultiplier screened by a long pass filter. The mean 2C DNA content of each target species is calculated by comparing its mean nuclear fluorescence with the mean nuclear fluorescence of an internal standard. Because of the variation of *Sorghum* DNA content, one of two different internal standards is used to avoid overlap of the standard and target species. One standard, *Arabidopsis thaliana* ecotype Columbia, has a genome size of 157 Mb or 1C = 0.16 pg. The DNA content of *A. thaliana* and *S. bicolo*r Tx623 (2C DNA content = 1.67 pg) is determined from 15 replicates of leaf samples from *S. bicolor* and *A. thaliana* Columbia. At least three replicates for each test sampleare analysed to obtain the mean DNA content (Price *et al*., 2005; Jessup *et al*., 2012).	The following footnote should be inserted: “The use of brand names of reagents, chemicals or equipment in this diagnostic protocol implies no approval of them to the exclusion of others that may also be suitable. This information is given for the convenience of users of this protocol and does not constitute an endorsement by the CPM of the chemical, reagent and/or equipment named. Equivalent products may be used if they can be shown to lead to the same results.	COSAVE, Argentina, Peru, Brazil, Uruguay, Chile, Paraguay	Incorporated.
48.	*155*	Editorial	A request for a revision to a diagnostic protocol may be submitted by national plant protection organizations (NPPOs), regional plant protection organizations (RPPOs) or Commission on Phytosanitary Measures (CPM) subsidiary bodies through the IPPC Secretariat (ippc@fao.org), which will in turn forward it to the Technical Panel on Diagnostic Protocols (TPDP).	Add "A" at the beginning of the sentence.	Canada	Incorporated.
49.	*164*	Editorial	**CSIRO.** 1978. *Sorghum* spp. hybrid (forage	Add a reference : Clayton, W.D.,	EPPO	Incorporated

			sorghum hybrids) cv. Silk. *Journal of the Australian Institute of Agricultural Science*, 44(3 and 4): 219–221.	Vorontsova, M.S., Harman, K.T. and Williamson, H. (2006 onwards). GrassBase - The Online World Grass Flora. http://www.kew.org/data/grasses-db.html.		
50.	*164*	Editorial	**CSIRO.** 1978. *Sorghum* spp. hybrid (forage sorghum hybrids) cv. Silk. *Journal of the Australian Institute of Agricultural Science,* 44(3 and 4): 219–221.	Add a reference: Clayton, W.D., Vorontsova, M.S., Harman, K.T. and Williamson, H. (2006 onwards). GrassBase - The Online World Grass Flora. http://www.kew.org/data/grasses-db.html.	European Union	Incorporated