

## PPS Keyword List: Keywords related to instrument from PPS vol. 1 - 20

### INSTRUMENT (97)

Keyword		Article title (downloadable pdf link)	Author	Year	DOI
3-D digitizer (1)		<a href="#">Radiometric Estimation of Canopy Leaf Inclination Angles of Various Crop Species Using Multi-Band Polarization and Reflectance</a>	Shibayama M.	2006	10.1626/pps.9.156
CE/TOF-MS (1)		<a href="#">Metabolite profiling of sheath blight disease resistance in rice: in the case of positive ion mode analysis by CE/TOF-MS</a>	Suharti WS, et al.	2016	10.1080/1343943X.2016.1140006
Chlorophyll meter (15)	Chlorophyll meter (3)	<a href="#">Effect of Leaf Phosphorus and Potassium Concentration on Chlorophyll Meter Reading in Rice</a>	Peng S, et al.	1999	10.1626/pps.2.227
		<a href="#">Comparison and Standardization among Chlorophyll Meters in their Readings on Rice Leaves</a>	Huang J, et al.	2004	10.1626/pps.7.97
		<a href="#">Correlation of Chlorophyll Meter Readings with Gas exchange and Chlorophyll Fluorescence in Flag Leaves of Rice (<i>Oryza sativa</i> L.) Plants</a>	Kumagai E, et al.	2009	10.1626/pps.12.50
	SPAD (6)	<a href="#">Comparison and Standardization among Chlorophyll Meters in their Readings on Rice Leaves</a>	Huang J, et al.	2004	10.1626/pps.7.97
		<a href="#">Continuous Monitoring of Visible and Near-Infrared Band Reflectance from a Rice Paddy for Determining Nitrogen Uptake Using Digital Cameras</a>	Shibayama M, et al.	2009	10.1626/pps.12.293
		<a href="#">Daytime and Nighttime Field Spectral Imagery of Ripening Paddy Rice for Determining Leaf Greenness and 1000-Grain Weight</a>	Shibayama M, et al.	2009	10.1626/pps.12.307
		<a href="#">Effects of Top Dressing on Growth and Panicle Dry Weight as Affected by Soil Water Stress at the Early Panicle-Development Stage in Rice (<i>Oryza sativa</i> L.)</a>	Tsuda M, et al.	2010	10.1626/pps.13.37
		<a href="#">Leaf Senescence of Soybean at Reproductive Stage is Associated with Induction of Autophagy-related Genes, <i>GmATG8c</i>, <i>GmATG8i</i> and <i>GmATG4</i></a>	Nang MPSH, et al.	2011	10.1626/pps.14.141
		<a href="#">Estimating Rice Leaf Greenness (SPAD) Using Fixed-Point Continuous Observations of Visible Red and Near Infrared Narrow-Band Digital Images</a>	Shibayama M, et al.	2012	10.1626/pps.15.293
	SPAD value (4)	<a href="#">Physio-Morphological Characters of F<sub>1</sub> Hybrids of Rice (<i>Oryza sativa</i> L.) in Japonica-Indica Crosses</a>	Sarker MAZ, et al.	2001	10.1626/pps.4.196
		<a href="#">Comparison of Leaf Photosynthesis between Wild and Cultivated Types of Soybean</a>	Saitoh K, et al.	2004	10.1626/pps.7.277
		<a href="#">Leaf Positions of Potato Suitable for Determination of Nitrogen Content with a SPAD Meter</a>	Li L, et al.	2012	10.1626/pps.15.317
		<a href="#">SPAD Values and Nitrogen Nutrition Index for the Evaluation of Rice Nitrogen Status</a>	Yang H, et al.	2014	10.1626/pps.17.81
	SPAD-502 (1)	<a href="#">Estimating the Mean Leaf Inclination Angle of Wheat Canopies Using Reflected Polarized Light</a>	Shibayama M, et al.	2007	10.1626/pps.10.329
	SPAD-502 meter (1)	<a href="#">Evaluation of the SPAD Value in Faba Bean (<i>Vicia faba</i> L.) Leaves in Relation to Different Fertilizer Applications</a>	Ahdelhamid M, et al.	2003	10.1626/pps.6.185
Chromatography (5)	High performance liquid chromatography (HPLC) (3)	<a href="#">Correlation between Growth Inhibitory Exhibition and Suspected Allelochemicals (Phenolic Compounds) in the Extract of Alfalfa (<i>Medicago sativa</i> L.)</a>	Xuan TD, et al.	2003	10.1626/pps.6.165
		<a href="#">Elementary Identification of Phenolic Allelochemicals from Dwarf Lilyturf Plant (<i>Ophiopogon japonicus</i> K.) and Their Growth-Inhibiting Effects for Two Weeds in Paddy Rice Field</a>	Lin D, et al.	2004	10.1626/pps.7.260
		<a href="#">Development of a High-Performance Liquid Chromatography Method to Determine the Fagopyrin Content of Tartary Buckwheat (<i>Fagopyrum tartaricum</i> Gaertn.) and Common Buckwheat (<i>F. esculentum</i> Moench)</a>	Eguchi K, et al.	2009	10.1626/pps.12.475
	Thin layer chromatography (TLC) (2)	<a href="#">Correlation between Growth Inhibitory Exhibition and Suspected Allelochemicals (Phenolic Compounds) in the Extract of Alfalfa (<i>Medicago sativa</i> L.)</a>	Xuan TD, et al.	2003	10.1626/pps.6.165
		<a href="#">Development of a High-Performance Liquid Chromatography Method to Determine the Fagopyrin Content of Tartary Buckwheat (<i>Fagopyrum tartaricum</i> Gaertn.) and Common Buckwheat (<i>F. esculentum</i> Moench)</a>	Eguchi K, et al.	2009	10.1626/pps.12.475

Colorimeter (3)	Colorimeter (1)	Xanthophyll levels in foxtail millet grains according to variety and harvesting time	Yano A, et al.	2017	10.1080/1343943X.2016.1246347
	Amylose-iodine colorimetry (2)	A Simple and Low-Cost Method to Classify Amylose Content of Rice Using a Standard Color Chart	Avaro MRA, et al.	2009	10.1626/ppls.12.97
		Two Alternative Methods to Predict Amylose Content of Rice Grain by Using Tristimulus CIE Lab Values and Developing a Specific Color Board of Starch-iodine Complex Solution	Avaro MRA, et al.	2011	10.1626/ppls.14.164
Cryo time-of-flight secondary ion mass spectrometry (cryo TOF-SIMS) (1)		Vertical Distribution of Sodium in Roots of Rice Plants Exposed to Salinity as Analyzed by Cryo Time-of-Flight Secondary Ion Mass Spectrometry	Ferdose J, et al.	2011	10.1626/ppls.14.215
Desiccator (1)	Desiccator method (1)	Pod Dehiscence in Soybean: Assessing Methods and Varietal Difference	Romkaew J, et al.	2006	10.1626/ppls.9.373
Digital camera (4)		Continuous Monitoring of Visible and Near-Infrared Band Reflectance from a Rice Paddy for Determining Nitrogen Uptake Using Digital Cameras	Shibayama M, et al.	2009	10.1626/ppls.12.293
		Estimating Paddy Rice Leaf Area Index with Fixed Point Continuous Observation of Near Infrared Reflectance Using a Calibrated Digital Camera	Shibayama M, et al.	2011	10.1626/ppls.14.30
		Regression-Based Models to Predict Rice Leaf Area Index Using Biennial Fixed Point Continuous Observations of Near Infrared Digital Images	Shibayama M, et al.	2011	10.1626/ppls.14.365
		Estimating Rice Leaf Greenness (SPAD) Using Fixed-Point Continuous Observations of Visible Red and Near Infrared Narrow-Band Digital Images	Shibayama M, et al.	2012	10.1626/ppls.15.293
Flow cytometry (1)		Association of Grain Shedding Habit with Polyploidy in Tartary Buckwheat ( <i>Fagopyrum tataricum</i> ) Strains	Oba S, et al.	2004	10.1626/ppls.7.212
Gradient system (1)		A System for the Measurement of Vertical Gradients of CO <sub>2</sub> , H <sub>2</sub> O and Air Temperature within and above the Canopy of Plant	Al-Saidi A, et al.	2009	10.1626/ppls.12.139
Ion meter (1)		A rapid quantification method for tissue Na <sup>+</sup> and K <sup>+</sup> concentrations in salt-tolerant and susceptible accessions in <i>Vigna vexillata</i> (L.) A. Rich.	Iseki K, et al.	2017	10.1080/1343943X.2016.1251826
Light-emitting diode (LED) (1)		Developmental Responses of Wheat cv. Norin 61 to Fluence Rate of Green Light	Kasajima S, et al.	2008	10.1626/ppls.11.76
Lysimeter (1)		Growth of Rice ( <i>Oryza sativa</i> L.) Cultivars under Upland Conditions with Different Levels of Water Supply. 3. Root System Development, Soil Moisture Change and Plant Water Status	Kato Y, et al.	2007	10.1626/ppls.10.3
Microscope (28)	Electron microscopy (8)	Electron Microscopy Related to the Reserve Mobilization in Germinating Rice Seed: Decomposition process of protein bodies	Zakaria S, et al.	1999	10.1626/ppls.2.100
		Morphological Studies on the Mobilization of Reserves in Germinating Rice Seed: Decomposition process of starch granules	Zakaria S, et al.	2000	10.1626/ppls.3.152
		Effects of Nitrogen Application on the Development and Accumulation of Protein Bodies in Developing Rice Seed	Zakaria S, et al.	2000	10.1626/ppls.3.84
		Effect of Temperature on the Decomposition of Reserves during Germination and Early Growth of Rice Plants: An electron microscopic study	Zakaria S, et al.	2001	10.1626/ppls.4.20
		Morphological Studies on the Mobilization of Reserves in Japanese Yam ( <i>Dioscorea japonica</i> Thunb.) Seed Tuber and Eddo ( <i>Colocasia esculenta</i> Schott var. <i>antiquorum</i> Hubbard & Rehder) Seed Corm on and after Sprouting	Kawasaki M, et al.	2001	10.1626/ppls.4.304
		Structural and Immunocytochemical Characterization of the Synthesis and Accumulation of Starch in Sweet Potato ( <i>Ipomoea batatas</i> Lam.) Tuberos Root	Kawasaki M, et al.	2002	10.1626/ppls.5.152
		Effect of High Temperature at Ripening Stage on the Reserve Accumulation in Seed in Some Rice Cultivars	Zakaria S, et al.	2002	10.1626/ppls.5.160
		Structural Changes and Fate of Crystalloplastids during Growth of Calcium Oxalate Crystal Idioblasts in Japanese Yam ( <i>Dioscorea japonica</i> Thunb.) Tubers	Kawasaki M, et al.	2004	10.1626/ppls.7.283
	Cryo scanning electron microscopy (1)	Changes in Surface Structure during Direct Somatic Embryogenesis in Rice Scutellum Observed by Scanning Electron Microscopy	Mariani TS, et al.	1998	10.1626/ppls.1.223
	Light microscopy (1)	Effects of Exogenous Glycinebetaine on Growth and Ultrastructure of Salt-Stressed Rice Seedlings ( <i>Oryza sativa</i> L.)	Rahman S, et al.	2002	10.1626/ppls.5.33
Immunofluorescence microscopy (1)	Analysis of Storage Protein Distribution in Rice Grain of Seed-Protein Mutant Cultivars by Immunofluorescence Microscopy	Ohdaira Y, et al.	2011	10.1626/ppls.14.219	

Microscope (continued)	Immunogold electron microscopy (1)	Structural and Immunocytochemical Characterization of the Synthesis and Accumulation of Starch in Sweet Potato ( <i>Ipomoea batatas</i> Lam.) Tuberos Root	Kawasaki M, et al.	2002	10.1626/pps. 5.152	
	Scanning electron microscope (SEM) (9)	Changes in Surface Structure during Direct Somatic Embryogenesis in Rice Scutellum Observed by Scanning Electron Microscopy	Mariani TS, et al.	1998	10.1626/pps. 1.223	
		Ultrastructural Analysis of Electrofused Protoplasts from Pansy and Wild Viola by Scanning Electron Microscopy	Sato T, et al.	1998	10.1626/pps. 1.288	
		Improvement of Direct Somatic Embryogenesis in Rice by Selecting the Optimal Developmental Stage of Explant and Applying Desiccation Treatment	Mariani TS, et al.	2000	10.1626/pps. 3.114	
		Immunogold Labeling of Rubisco in C <sub>4</sub> Plant Leaves for Scanning Electron Microscopy	Miyake H, et al.	2001	10.1626/pps. 4.41	
		Optical Microscopy and Scanning Electron Microscopy on the Surface of Rice Callus after Treatment with Cell Wall Degrading Enzymes	Sato T, et al.	2001	10.1626/pps. 4.145	
		Initiation and Development of Spikelets and Florets in Wheat as Influenced by Shading and Nitrogen Supply at the Spikelet Phase	Toyota M, et al.	2001	10.1626/pps. 4.283	
		Hardness Distribution and Endosperm Structure on Polishing Characteristics of Brewer's Rice Kernels	Tamaki M, et al.	2007	10.1626/pps. 10.481	
		Effects of Elevated Atmospheric Carbon Dioxide Concentration on Silica Deposition in Rice ( <i>Oryza sativa</i> L.) Panicle	Takahashi N, et al.	2008	10.1626/pps. 11.307	
		Endosperm Structure of White-Belly and White-Core Rice Grains Shown by Scanning Electron Microscopy	Xi M, et al.	2014	10.1626/pps. 17.285	
		Transmission electron microscope (TEM) (7)	Epidermal Cell Wall Biogenesis with Emphasis on Cuticular Layer Formation during Direct Somatic Embryogenesis in Rice	Mariani TS, et al.	1999	10.1626/pps. 2.206
	Ultrastructure of Mesophyll Glands Secreting the Aromatic Substances in Patchouli Leaves		Maeda E, et al.	1999	10.1626/pps. 2.213	
	Salinity-Induced Ultrastructural Alterations in Leaf Cells of Rice ( <i>Oryza sativa</i> L.)		Rahman S, et al.	2000	10.1626/pps. 3.422	
	Effects of Salinity Stress on the Seminal Root Tip Ultrastructures of Rice Seedlings ( <i>Oryza sativa</i> L.)		Rahman S, et al.	2001	10.1626/pps. 4.103	
	Plastid Damage in Photosynthetic Cells of Mizugayatsuri ( <i>Cyperus serotinus</i> ) Leaves Treated with a Pyrazole Herbicide		Ogawa M, et al.	2001	10.1626/pps. 4.291	
	Effects of Exogenous Glycinebetaine on Growth and Ultrastructure of Salt-Stressed Rice Seedlings ( <i>Oryza sativa</i> L.)		Rahman S, et al.	2002	10.1626/pps. 5.33	
	Relationship between the Distribution of Na and the Damages Caused by Salinity in the Leaves of Rice Seedlings Grown under a Saline Condition		Mitsuya S, et al.	2002	10.1626/pps. 5.269	
	Near-infrared (10)	Near-infrared (7)	Near-Infrared Reflectance Spectroscopic Analysis of Moisture, Fat, Protein, and Physiological Activity in Buckwheat Flour for Breeding Selection	Sato T, et al.	2001	10.1626/pps. 4.270
			Nondestructive Near-Infrared Reflectance Spectroscopy of Sesame ( <i>Sesamum indicum</i> L.) Components by Single Seed Analysis	Sato T, et al.	2006	10.1626/pps. 9.161
			Nondestructive Measurements of Lipid Content and Fatty Acid Composition in Rapeseeds ( <i>Brassica napus</i> L.) by Near Infrared Spectroscopy	Sato T.	2008	10.1626/pps. 11.146
Use of Near-infrared Reflectance Spectroscopy for the Estimation of the Isoflavone Contents of Soybean Seeds			Sato T, et al.	2008	10.1626/pps. 11.481	
Continuous Monitoring of Visible and Near-Infrared Band Reflectance from a Rice Paddy for Determining Nitrogen Uptake Using Digital Cameras			Shibayama M, et al.	2009	10.1626/pps. 12.293	
Estimating Paddy Rice Leaf Area Index with Fixed Point Continuous Observation of Near Infrared Reflectance Using a Calibrated Digital Camera			Shibayama M, et al.	2011	10.1626/pps. 14.30	
Regression-Based Models to Predict Rice Leaf Area Index Using Biennial Fixed Point Continuous Observations of Near Infrared Digital Images			Shibayama M, et al.	2011	10.1626/pps. 14.365	
Near-infrared spectroscopy (2)		Nondestructive Near-Infrared Reflectance Spectroscopic Analyses of the Major Constituents of Sesame ( <i>Sesamum indicum</i> L.) Whole Seeds with Different Coat Color	Sato T, et al.	2004	10.1626/pps. 7.363	
		Application of Near-Infrared Diffuse Reflectance Spectroscopic Analysis for Estimating the Ratio of True Seed Weight to Fruit Weight in Sugar Beet Seed	Mukasa Y, et al.	2005	10.1626/pps. 8.3	
Near-infrared transmittance technique (1)		Effect of Genotype, Environment and Their Interaction on Quality Parameters of Wheat Breeding Lines of Diverse Grain Hardness	Surma M, et al.	2012	10.1626/pps. 15.192	

NMR (4)	<sup>1</sup> H-NMR (1)	Ascorbic Acid Suppresses Germination and Dynamic States of Water in Wheat Seeds	Ishibashi Y, et al.	2006	10.1626/pps. 9.172
	NMR relaxation time ( <i>T1</i> and <i>T2</i> ) (3)	Cold- or Heat-Tolerance of Leaves and Roots in Perennial Ryegrass Determined by <sup>1</sup> H-NMR	Iwaya-Inoue M, et al.	2004	10.1626/pps. 7.118
		Influence of Low/High Temperature on Water Status in Developing and Maturing Rice Grains	Funaba M, et al.	2006	10.1626/pps. 9.347
		Changes in NMR Relaxation of Rice Grains, Kernel Quality and Physicochemical Properties in Response to a High Temperature after Flowering in Heat-Tolerant and Heat-Sensitive Rice Cultivars	Tanaka K, et al.	2009	10.1626/pps. 12.185
Oven (1)	Oven-dried method (1)	Pod Dehiscence in Soybean: Assessing Methods and Varietal Difference	Romkaew J, et al.	2006	10.1626/pps. 9.373
Oxygen electrode (1)		Concurrent Monitoring of Oxygen Evolution and Chlorophyll Fluorescence in Mungbean Leaves with a Liquid-Phase Oxygen Electrode	Yoshimura Y, et al.	2000	10.1626/pps. 3.229
Particle bombardment (2)	Particle bombardment (1)	Transient Expression of Green Fluorescent Protein in Rice Calluses: Optimization of Parameters for Helios Gene Gun Device	Carsono N, et al.	2008	10.1626/pps. 11.88
	Helios gene gun (1)	Transient Expression of Green Fluorescent Protein in Rice Calluses: Optimization of Parameters for Helios Gene Gun Device	Carsono N, et al.	2008	10.1626/pps. 11.88
PCR (1)		Effects of High Nitrogen Supply on the Susceptibility to Coolness at the Young Microspore Stage in Rice ( <i>Oryza sativa</i> L.): Gene Expression Analysis in Mature Anthers	Hayashi T, et al.	2009	10.1626/pps. 12.271
Photodiode (1)		Spatial and Temporal Variation in Photon Flux Density on Rice ( <i>Oryza sativa</i> L.) Leaf Surface	Nishimura S, et al.	1998	10.1626/pps.1 .30
Plant canopy analyzer (2)	Plant canopy analyzer (1)	Radiometric Estimation of Canopy Leaf Inclination Angles of Various Crop Species Using Multi-Band Polarization and Reflectance	Shibayama M.	2006	10.1626/pps. 9.156
	LAI-2000 (1)	Estimating the Mean Leaf Inclination Angle of Wheat Canopies Using Reflected Polarized Light	Shibayama M, et al.	2007	10.1626/pps. 10.329
Solarimeter (1)	Integrated solarimeter film (1)	Transpiration and Leaf Movement of Cotton Cultivars Grown in the Field under Arid Conditions	Wang C, et al.	2004	10.1626/pps. 7.266
Spectroscopy (4)		Near-Infrared Reflectance Spectroscopic Analysis of Moisture, Fat, Protein, and Physiological Activity in Buckwheat Flour for Breeding Selection	Sato T, et al.	2001	10.1626/pps. 4.270
		Nondestructive Near-Infrared Reflectance Spectroscopy of Sesame ( <i>Sesamum indicum</i> L.) Components by Single Seed Analysis	Sato T, et al.	2006	10.1626/pps. 9.161
		Nondestructive Measurements of Lipid Content and Fatty Acid Composition in Rapeseeds ( <i>Brassica napus</i> L.) by Near Infrared Spectroscopy	Sato T.	2008	10.1626/pps. 11.146
		Use of Near-infrared Reflectance Spectroscopy for the Estimation of the Isoflavone Contents of Soybean Seeds	Sato T, et al.	2008	10.1626/pps. 11.481
Stability-testing chamber (1)		An Efficient Method for Evaluating the Palatability Deterioration During Storage in Rice	Matsue Y, et al.	2003	10.1626/pps. 6.107
Two-dimensional polyacrylamide gel electrophoresis (2D SDS-PAGE) (2)		Effect of Phosphoric Amide Herbicide APM on the Structure and Protein Composition of Chromosome in <i>Triticum durum</i>	Peng Y, et al.	2003	10.1626/pps. 6.134
		Susceptibility to Coolness at the Young Microspore Stage under High Nitrogen Supply in Rice ( <i>Oryza Sativa</i> L.): Proteome Analysis of Mature Anthers	Hayashi T, et al.	2006	10.1626/pps. 9.212
X-ray (3)	X-ray microanalysis (2)	Silica Distribution on the Husk Epidermis at Different Parts of the Panicle in Rice ( <i>Oryza sativa</i> L.) Determined by X-ray Microanalysis	Takahashi N, et al.	2006	10.1626/pps. 9.168
		Effects of Elevated Atmospheric Carbon Dioxide Concentration on Silica Deposition in Rice ( <i>Oryza sativa</i> L.) Panicle	Takahashi N, et al.	2008	10.1626/pps. 11.307
	Energy-dispersive X-ray analysis (1)	The Involvement of Silicon Deposition in Salinity-Induced White Head in Rice ( <i>Oryza sativa</i> L.)	Tsuda M, et al.	2000	10.1626/pps. 3.328