(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
2 October 2014 (02.10.2014)

WIPO | PCT

(10) International Publication Number
WO 2014/155388 A1

(51) International Patent Classification:
C05C 11/00 (2006.01) *C05G 1/00* (2006.01)

(21) International Application Number:
PCT/IN2014/000135

(22) International Filing Date:
28 February 2014 (28.02.2014)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
1404/CHE/2013 28 March 2013 (28.03.2013) IN

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

WO 2014/155388 A1

(54) Title: A COMPOSITION FOR FERTIGATION

(57) Abstract: The present invention relates to a composition for fertigation. More particularly, the present invention relates to a composition, comprising heterocyclic nitrogen; phosphonic sequester (P2O5); and dipotassium oxide (K2O). The composition may either be in soluble liquid or soluble powder form. The heterocyclic nitrogen is derived from pyrimidine series or hexamine. The heterocyclic nitrogen in soluble form helps plants to synthesize enormous amount of materials by photosynthesis and by secondary photosynthesis and biochemical reactions. Sequestering agent amino trimethylene phosphonic acid (ATMP) sequestering agent delivers nutrients in soluble forms to plants.

A COMPOSITION FOR FERTIGATION

FIELD OF INVENTION

The present invention relates to a composition for fertigation. More particularly, the present invention relates to a composition, comprising heterocyclic nitrogen and phosphonic sequester (P_2O_5), both in soluble form, with neutralizer potassium hydroxide (KOH) or potassium chloride (KCl). The present invention also provides a process of preparation of the composition for fertigation. The heterocyclic nitrogen in soluble form helps plants to synthesize enormous amount of materials by photosynthesis and by secondary photosynthesis and biochemical reactions. Sequestering agent amino trimethylene phosphonic acid (ATMP) delivers nutrients in soluble forms to plants.

DESCRIPTION OF PRIOR ART

Fertigation is widely used in agriculture and horticulture to feed nutrients to plants through irrigation water. Uptake of nutrients by fertigation is higher than by conventional methods. Efficiency of fertilizer use through fertigation is in the range of 80-90 percent and this helps to save nutrients upto 25 percent. In fertigation, nutrient and water are applied at the root zone for greater absorption by plants. At present the fertigation segment, i.e drip, sprinkler and fogging is covered by conventional soluble fertilizer. Some of the commonly used nutrients or fertilizers applied through irrigation systems are soluble like Mono Ammonium Phosphate (MAP), Mono Potassium Phosphate (MKP), 19:19:19, potassium nitrate (KNO_3) etc. However, Heterocyclic Nitrogen and Phosphonic Acid (phosphonics are second generation chelating agents) are not used in present fertigation.

Chelated compounds are widely used in agriculture for supplying plant with micronutrients as plant may have trouble getting the required micronutrients due to fixation and even when soil contains the required amount. Chelates such as ethylene diamine tetra acetic acid (EDTA) are commonly used. Micronutrients chelated by amino trimethylene phosphonic acid (ATMP) are taken up by the plants easily. Moreover, in soil, chelating agent is required in adequate quantity or powerful chelants in small quantities for use with microelements and calcium (Zn, Mn, Fe, Cu and Mg). Known in prior art is a mineral containing polymeric composition having high aqueous dispersibility which may be used in fertigation where minerals are applied to the soil or for

emergent plants. It is important to get chelation in soil to make nutrients available to plants. Using conventional soluble and then going for chelated products in irrigation systems is a costly venture and all in one is economical, i.e. nutrients, chelants and hormones.

US6258749 relates to methods and formulations for treating plants and enhancing plant growth and for safening high concentrations of phyto catalysts, such as ammonium, by applying a formulation, comprising one or more polyacyl glycosides andoror polyalkyl glycosides, to the plants.

US6110866 relates to mixed agricultural compositions used to improve plant growth, enhance pest control, and facilitate bioremediation. The agricultural compositions are prepared by a process comprising mixing together nonionic polyglycol ethers, or oxidation products thereof, and a carrier material.

US20110098177 relates to a method for providing a metal to a plant in a manner such that a marketable yield trait of the plant is increased.

CN1238323 relates to a multifunctional foliar fertilizer serving as agricultural chemical, fertilizer and growth regulator contains such active components as purine and pyrimidine as the degradated substance of nucleic acid, cycocel, paclobutrazol, rare-earth elements, the macro-, middle- and trace-elements necessary for plant growth, and photorespiration regulator.

CN101186534 relates to a preparation method of a foliar fertilizer which comprises nucleic acid degradation products.

GB1013460 relates to a method of inhibiting the nitrification of ammonium nitrogen in soil and a fertilizer composition therefor. Conversion of ammonium to nitrate ions in soil is inhibited by treatment with a pyrimidine derivative. The pyrimidine derivative may be employed in an amount of 1-100 parts per million parts of soil and may be in a composition together with a reduced nitrogen fertilizer.

Accordingly, there exists a need for a composition for fertigation having life preferred heterocyclic nitrogen and sequestering agent to deliver the nutrients to plants in an efficient way.

The composition of the present invention in fertigation helps to enrich the soil and saves fertilizer by 50 per cent and water upto 60 per cent.

OBJECTS OF INVENTION

The primary object of the present invention is to provide a composition for fertigation comprising heterocyclic nitrogen and phosphonic sequester (P_2O_5), both in soluble form, with neutralizer potassium hydroxide (KOH) or potassium chloride (KCl).

It is another object of the present invention, wherein the heterocyclic nitrogen helps plants to synthesize enormous amount of biochemicals by photosynthesis and biochemical reactions.

It is another object of the present invention, wherein sequestering agent amino trimethylene phosphonic acid (ATMP), makes the insoluble nutrients in the soil to soluble nutrients and thus delivers the nutrients to plants.

It is another object of the present invention to provide a process of preparation of the composition for fertigation.

In one aspect of the present invention, the composition for fertigation comprises ATMP, pyrimidine series or hexamine as the main ingredients and KOH or KCl as the neutralizing agent.

It is another object of the present invention, wherein the pyrimidine series includes pyrimidine or pyrazine or diaminopyrimidine.

In another aspect of the present invention, the composition for fertigation comprises ATMP Na_2 (Disodium Salt of Amino Trimethylene Phosphonic Acid), pyrimidine series or hexamine as the main ingredients and KOH or KCl as the neutralizing agent.

In yet another aspect of the present invention, the composition for fertigation comprises ATMP K (Potassium Salt of Amino Trimethylene Phosphonic Acid), pyrimidine series or hexamine as the main ingredients.

It is another object of the present invention, wherein the ATMP, its sodium and potassium salt provides phosphonic sequester (P_2O_5) nutrition and chelation to plants or crops.

It is another object of the present invention, wherein the pyrimidine series (water-soluble) or hexamine provides heterocyclic nitrogen to plants or crops.

It is another object of the present invention, wherein the KOH or KCl provides potash to plants or crops.

It is another object of the present invention, wherein the final composition for fertigation may either be in soluble liquid or solid (powder) form based on reactants used for the preparation as percentage of nutrients in different dosage are required for different plants or crops.

It is another object of the present invention, wherein the final composition in liquid form using ATMP and pyrimidine series or hexamine as the main ingredients gives 10.6% heterocyclic nitrogen, 7% P_2O_5 and 6 to 9 % dipotassium oxide (K_2O).

It is another object of the present invention, wherein the final composition in solid form using ATMP Na_2 (Disodium Salt of Amino Trimethylene Phosphonic Acid) and pyrimidine series or hexamine as the main ingredients gives 21% heterocyclic nitrogen, 11 % P_2O_5 and 6 to 9% K_2O.

It is another object of the present invention, wherein the final composition in liquid form using ATMP K (Potassium Salt of Amino Trimethylene Phosphonic Acid) and pyrimidine series or hexamine as the main ingredients gives 21% heterocyclic nitrogen, 5.2% P_2O_5 and 6.8% K_2O.

It is another object of the present invention, wherein the liquid composition is used in soft water areas and the solid (powder) form of the composition is used in hard water areas.

It is another object of the present invention, wherein pH of final composition is between 5 and 6 which works well when in soil.

SUMMARY OF INVENTION

Thus according to the basic aspect of the present invention there is provided a composition for fertigation comprising:

heterocyclic nitrogen;

phosphonic sequester (P_2O_5); and

dipotassium oxide (K_2O),

wherein the composition may either be in soluble liquid or soluble powder form.

It is another aspect of the present invention, wherein the heterocyclic nitrogen is derived from pyrimidine series or hexamine, the said pyrimidine series include pyrimidine or pyrazine or diaminopyrimidine.

It is another aspect of the present invention, wherein the phosphonic sequester (P_2O_5) nutrition and chelation is derived from sequestering agent selected from one amongst Amino Trimethylene Phosphonic Acid (ATMP), its disodium salt or its potassium salt.

It is another aspect of the present invention, wherein pH of the composition is between 5 and 6.

In one aspect of the present invention, the composition in soluble liquid form comprising:

Pyrimidine series	: 32 kg;
[or]	
Hexamine	: 28.8 kg
ATMP	: 20 kg;
KOH or KCL	: 10 kg; and
H_2O	: 38 kg,

wherein the KOH (Potassium hydroxide) or KCl (Potassium Chloride) provides potash, and

wherein final composition in soluble liquid form comprising 10.6% heterocyclic nitrogen, 7% P_2O_5 and 6 to 9 % K_2O.

It is another aspect of the present invention, wherein a process for preparation of composition in soluble liquid form comprising:

i. Mixing 32 kg of liquid pyrimidine series or 28.8 kg of liquid hexamine with 20 kg of ATMP to form pyrimidine series ATMP complex or hexamine ATMP complex;

ii. Subjecting to mild heating of pyrimidine series ATMP complex or hexamine ATMP complex at temperature ranges between 25 degree C and 30 degree C;

iii. Adding 10 kg KOH or KCl to the resultant composition for neutralization; and

iii. Adding 38 kg of water to the resulting composition obtained to yield final composition in soluble liquid form.

In another aspect of the present invention, the composition in soluble powder form comprising:

Pyrimidine series	: 60 kg;
[or]	
Hexamine	: 54 kg;
ATMP Na_2	:20 kg;
H_2O	: 38 kg;
KOH or KCL	: 10 kg; and
Dispersal	: 16 kg,

wherein the KOH or KCl provides potash, and

wherein final composition in soluble powder form comprising 21% heterocyclic nitrogen, 11 % P_2O_5 and 6 to 9% K_2O.

It is another aspect of the present invention, wherein a process for preparation of composition in soluble powder form comprising:

i. Mixing 60 kg of pyrimidine series or 54 kg of hexamine in powder form with 20 kg of ATMP Na_2;

ii. Dissolving the resultant composition obtained in 38 kg of water, boiled and secured slurry;

iii. Adding 10 kg KOH or KCl to the slurry;

iii. Machine drying the resultant composition; and

iv. Adding 10 kg alkyl aryl sulphonate dispersal to the dried composition which is further blended mechanically to yield final composition in powder form.

In yet another aspect of the present invention, the composition in liquid form comprising:

Pyrimidine series	: 60 kg;
[or]	
Hexamine	: 54 kg;
ATMP K	: 20 kg; and
H_2O	: 20 kg,

wherein final composition in liquid form comprising 21% heterocyclic nitrogen, 5.2% P_2O_5 and 6.8% K_2O.

It is another aspect of the present invention, wherein a process for preparation of composition in liquid form comprising:

i. Mixing 60 kg pyrimidine series or 54 kg of hexamine with 20 kg ATMP K ($C_3H_6K_6NO_9P_3$) and subjecting to mild heating upto 25 degree C; and

ii. Dissolving the resultant composition obtained in 20 kg of water to yield final composition in liquid form.

DETAILED DESCRIPTION OF THE INVENTION

The present invention as herein discussed relates to a composition for fertigation comprising heterocyclic nitrogen; phosphonic sequester (P_2O_5); and dipotassium oxide (K_2O). The composition may either be in soluble liquid or soluble powder form. The heterocyclic nitrogen is derived from pyrimidine series or hexamine. The pyrimidine series include pyrimidine or pyrazine or diaminopyrimidine. The heterocyclic nitrogen in soluble form helps plants to synthesize enormous amount of materials by photosynthesis and by secondary photosynthesis and biochemical reactions. The phosphonic sequester (P_2O_5) from phosphonic nutrition and chelation. The sequestering agent selected is from one amongst Amino Trimethylene Phosphonic Acid (ATMP), its disodium salt or its potassium salt. 1 gram ATMP will chelate 630 gram $CaCO_3$.

In one aspect of the present invention, the composition for fertigation comprises ATMP, pyrimidine series or hexamine as the main ingredients and KOH or KCl as the neutralizing agent.

The foregoing aspect of the present invention is illustrated in the following example:

EXAMPLE 1:

Ingredients and Composition:

Pyrimidine series	: 32 kg (liquid);
[or]	
Hexamine	: 28.8 kg (liquid)
ATMP	: 20 kg (liquid);
KOH or KCL	: 10 kg; and
H_2O	: 38 kg,

wherein the final composition obtained is in soluble liquid form.

A process for preparation of composition in soluble liquid form comprising:

i. Mixing 32 kg of liquid pyrimidine series or 28.8 kg of liquid hexamine with 20 kg of ATMP to form pyrimidine series ATMP complex or hexamine ATMP complex;

ii. Subjecting to mild heating of pyrimidine series ATMP complex or hexamine ATMP complex at temperature ranges between 25 degree C and 30 degree C;

iii. Adding 10 kg KOH (Potassium hydroxide) or KCl (Potassium Chloride) to the resultant composition for neutralization; and

iii. Adding 38 kg of water to the resulting composition obtained to yield final composition in soluble liquid form,

wherein the final composition in soluble liquid form comprising 10.6% heterocyclic nitrogen, 7% P_2O_5 and 6 to 9 % dipotassium oxide (K_2O).

In another aspect of the present invention, the composition for fertigation comprises ATMP Na_2 (Disodium Salt of Amino Trimethylene Phosphonic Acid), pyrimidine series or hexamine as the main ingredients and KOH or KCl as the neutralizing agent.

The foregoing aspect of the present invention is illustrated in the following example:

EXAMPLE 2:

Ingredients and Composition:

Pyrimidine series	: 60 kg (powder);
[or]	
Hexamine	: 54 kg (powder)
ATMP Na_2	: 20 kg (powder);
H_2O	: 38 kg;
KOH or KCL	: 10 kg; and
Dispersal	: 10 kg,

wherein the composition obtained is in soluble free flowing powder form.

A process of preparation of composition provided in soluble free flowing powder form comprising:

i. Mixing 60 kg of pyrimidine series or 54 kg of hexamine in powder form with 20 kg of ATMP Na_2;

ii. Dissolving the resultant composition obtained in 38 kg of water, boiled and secured slurry;

iii. Adding 10 kg KOH or KCl to the slurry;

iii. Machine drying the resultant composition; and

iv. Adding 10 kg dispersal i.e alkyl aryl sulphonate to the dried composition which is further blended mechanically to yield final composition in powder form,

wherein the final composition in powder form comprising 21% heterocyclic nitrogen, 11 % P_2O_5 and 6 to 9% K_2O.

In yet another aspect of the present invention, the composition for fertigation comprises ATMP K (Potassium Salt of Amino Trimethylene Phosphonic Acid), pyrimidine series or hexamine as the main ingredients.

The foregoing aspect of the present invention is illustrated in the following example:

Ingredients and Composition:

ATMP K	: 20 kg (liquid);
Pyrimidine series	: 60 kg (liquid);
[or]	
Hexamine	: 54 kg (liquid); and
H_2O	: 20 kg,

wherein the composition obtained is in liquid form.

The composition is used in areas where potash is required in fused form especially in fruiting trees.

A process of preparation of composition provided in liquid form comprising:

i. Mixing 60 kg pyrimidine series or 54 kg of hexamine with 20 kg ATMP K ($C_3H_6K_6NO_9P_3$) and subjecting to mild heating upto 25 degree C; and

ii. Dissolving the resultant composition obtained in 20 kg of water to yield final composition in liquid form,

wherein the final composition in liquid form comprising 21% heterocyclic nitrogen, 5.2% P_2O_5 and 6.8% K_2O.

The ATMP, its sodium and potassium salt provides phosphonic sequester (P_2O_5) nutrition and chelation to plants or crops. The pyrimidine series or hexamine (water-soluble) provides heterocyclic nitrogen to plants or crops. The KOH or KCl provides potash to plants or crops. The final composition for fertigation may either be in liquid or solid (powder) form based on reactants used for the preparation as percentage of nutrients in different dosage are required for different plants or crops. The liquid composition is used in soft water areas and the solid (powder) form of the composition is used in hard water areas. The pH of final composition is between 5 and 6 which works well when in soil.

The composition of the present invention in soluble liquid and soluble powder forms can be used in drip, sprinkler and fogging irrigation systems. The present invention will help in import substitution, chelating soil and making nutrients soluble and available to plants. The final composition of the present invention comprises the main component, heterocyclic nitrogen, which is the anchor chemical in life for both plants and animals.

Various field experiments were conducted to study the effect of fertigation composition according to the present invention on plants/crops. 'Allwin Top' is the trade name and herein after used refers to the fertigation composition of the present invention. 'Allwin Top' referring to fertigation composition contains heterocyclic nitrogen, sequestering phosphate and potash.

Table-1 shows effect of Allwin Top drip special on yield attributes of groundnut evaluated by Directorate of groundnut research (Indian council of agricultural research). Table-2 shows effect of Allwin Top drip special on yield and harvest index of groundnut.

TABLE-1:

Treatment	Mature Pods/plant (g)			Immature Pods/plant (g)			100-kernal weight (g)			Shelling out-turn (%)		
	2011	2012	Pooled	2011	2012	Pooled	2011	2012	Pooled	2011	2012	Pooled
T_1: 226.5kg/ha Allwin Top Drip Special	7.4	13.2	10.3	0.41	1.22	1.48	45.3	42.1	43.7	71.0	66.1	68.6
T_2: 250 kg/ha Allwin Top Drip Special	4.5	11.5	8.0	0.64	1.92	2.03	42.9	41.7	42.3	67.5	64.4	65.9
T_3: 150 kg/ha Allwin Top Drip Special	5.4	11.2	8.3	0.94	2.81	2.50	44.9	40.1	42.5	68.1	63.1	65.6
T_4: Regular recommendations (RDF)	5.9	12.8	9.3	0.68	2.03	2.12	41.5	39.8	40.6	69.7	63.3	66.5
T_5: T_1 +Allwin legume spray	5.0	10.2	7.6	0.23	0.68	1.94	42.3	40.8	41.5	68.2	65.1	66.6
T_6: Control	3.7	8.8	6.3	0.28	0.84	2.21	40.3	39.2	39.8	65.3	65.2	65.3
CD (P=0.05)	1.0	1.5	1.0	0.14	0.37	0.22	NS	NS	2.8	NS	NS	2.5

Treatment	Pod Yield (kg/ha)			Haulm yield (kg/ha)			kernal yield (kg/ha)			Biological yield (kg/ha)			Harvest Index (%)		
	2011	2012	Pooled	2011	2012	Pooled	2011	2012	Pooled	2011	2012	Pooled	2011	2012	Pooled
T_1: 226.5kg/ha Allwin Top Drip Special	2514	2819	2667	5368	4546	4957	1785	1864	1824	7882	7365	7623	31.8	38.3	35.1
T_2: 250 kg/ha Allwin Top Drip Special	1868	2429	2148	4369	4089	4229	1263	1562	1412	6237	6518	6378	30.8	37.3	33.6
T_3: 150 kg/ha Allwin Top Drip Special	2039	2633	2336	4728	4068	4398	1390	1664	1527	6767	6702	6734	30.1	39.3	34.7
T_4: Regular recommendations (RDF)	2290	2562	2426	4950	4261	4605	1595	1622	1608	7239	6824	7031	31.6	37.6	34.6
T_5: T_1 +Allwin legume spray	1883	2462	2172	4346	3988	4167	1282	1603	1443	6229	6450	6339	30.2	38.2	34.2
T_6: Control	1679	2266	1973	4023	3782	3902	1094	1477	1285	5702	6048	5875	29.5	37.4	33.5
CD (P=0.05)	179	157	144	292	192	211	136	115	108	397	213	272	NS	NS	NS

Physiological impact of Allwin Top drip special in groundnut was evaluated by Tamil Nadu Agricultural University. Table-3 shows effect of Allwin Top drip special on yield in groundnut (Mean of four replicates) and Table-4 shows effect of Allwin Top drip special on chlorophyll content (mg. g-1) in groundnut (Mean of four replicates).

TABLE -3:

Treatments	Yield (kg/16.7 cent	Yield (kg/ha)
T_1 - 200 kg/ha Allwin Top Drip Special 5,10,30,60,90 DAS	177.0	2650
T_2 - 250 kg/ha Allwin Top Drip Special 5,10,30,60,90 DAS	174.3	2610
T_3 - 150 kg/ha Allwin Top Drip Special 5,10,30,60,90 DAS	183.7	2750
T_4 - Traditional fertilizer + Regular Allwin Top @ 1 kg/ha – 5,10,30,60,90 DAS	159.0	2380
T_5. Control	140.9	2110
T_6 - 100 kg/ha Allwin Top Drip Special - 5,10,30,60,90 DAS	171.7	2570
CD (p=0.05)		473.5

TABLE -4:

Treatments	Chl. 'a'	Chl. 'b'	Total
T_1 - 200 kg/ha Allwin Top Drip Special 5,10,30,60,90 DAS	1.82	0.62	2.44
T_2 - 250 kg/ha Allwin Top Drip Special 5,10,30,60,90 DAS	1.91	0.71	2.62
T_3 - 150 kg/ha Allwin Top Drip Special 5,10,30,60,90 DAS	2.23	0.87	3.10
T_4 - Traditional fertilizer + Regular Allwin Top @ 1 kg/ha – 5,10,30,60,90 DAS	1.95	0.66	2.61
T_5. Control	1.78	0.60	2.38
T_6 - 100 kg/ha Allwin Top Drip Special - 5,10,30,60,90 DAS	1.82	0.64	2.46

Tables-5 and 6 shows effect of Allwin Top drip special under drip fertigation in Okra evaluated by Department of Crop Physiology, Tamil Nadu Agricultural University. Table-5 evaluates the bio-efficacy of Allwin Top drip special under drip fertigation in Okra. Table-6 shows effect of soluble fertilizers on yield kg plot-1 and yield kg ha-1 of Okra under drip fertigation.

TABLE-5:

S. No	Treatments	Time of Application
1	300kg/ha Allwin Top Drip Special	5, 10, 20, 30 and 60 DAS
2	200kg/ha Allwin Top Drip Special	5, 10, 20, 30 and 60 DAS
3	150kg/ha Allwin Top Drip Special	5, 10, 20, 30 and 60 DAS
4	Traditional fertilizers (N 40 kg, P_2O_5 50 kg and K_2O 30 kg ha^{-1})	5, 10, 20, 30 and 60 DAS
5	Control (Basal and Top Dressing)	N 20 kg, P_2O_5 50 kg and K_2O 30 kg ha^{-1} as basal and N 20kg ha^{-1} (30 DAS)

OBSERVATIONS RECORDED:

- Morphological, growth parameters, physiological and biochemical parameters were recorded during three stages of the crop.
- Yield and quality parameters were recorded after harvest of the crop.
- The benefit cost ratio (BCR) was calculated from field preparation to harvest.

The lower mean values for pod yield was found in control which was closely followed by T4. The percentage increase over the control showed that the treatment T1 recorded 44.0 per cent in pod yield kg plo-1and 43.9 per cent in yield kg ha-1.

TABLE-6:

Treatments	Yield (kg $plot^{-1}$)	Yield (kg ha^{-1})
T1	13.4	17120.0
T2	11.2	14313.5
T3	10.3	13164.1
T4	9.5	12142.3
T5	7.5	9588.1
Mean	10.3	13265.6
SEd	0.009	3.836
CD (5%)	0.020	8.358

Benefit Cost Ratio (BCR):

The BCR was calculated for the treatments T1, T2, T3, T4 and T5 as shown in Table-6. The BCR was the highest for soluble fertilizer Allwin Top drip special @ 300kg/ha (T1) (1.79) followed by (T2, T3 and T4). The least in BCR was shown by the control T5 (1.47).

Department of Agronomy, Annamalai University evaluated technical study on water and fertilizer saving through drip irrigation in brinjal and sunflower with Allwin Top drip special. Table-7 shows effect of Allwin Top drip special on the growth and yield parameters of Brinjal. Table-8 shows effect of Allwin Top drip special on the growth and yield parameters of Sunflower.

TABLE-7:

S. No	Treatments	Plant height (cm)	No of flowers/plant	No of fruits/plant	Single fruit weight (gm)	Yield kg ha^{-1}
1	T_1 – 100 kg Allwin top drip special ha^{-1}	21.64	7.8	6.2	34	11234
2	T_2 – 200 kg Allwin top drip special ha^{-1}	30.96	11.2	9.4	46	12200
3	T_3 – 250 kg Allwin top drip special ha^{-1}	23.48	10.4	8.6	40	11800
4	T_4 – Regular fertilizer application and 1 kg Allwin top regular	25.70	6.6	5.2	28.4	10800
5	T_5 - Control	20.88	5	4	18	2600
	S.Ed	0.91	0.35	0.4	2.45	26.41
	C.D (P=0.05)	1.82	0.70	0.8	4.9	60.90

TABLE-8:

S. No	Treatments	Plant height (cm)	Leaf surface	Head diameter	Oil Content (%)	Seed yield kg ha^{-1}
1	50 kg Allwin top drip special ha^{-1}	125.3	3.62	12.6	37.3	914
2	100 kg Allwin top drip special ha^{-1}	131.4	3.97	13.8	37.5	1265
3	150 kg Allwin top drip special ha^{-1}	128.7	3.84	13.1	37.4	1050
4	Regular fertilizer application + 1 kg Allwin top regular	121.0	3.57	12.0	37.2	907
5	T_5 - Control	119.2	3.20	11.6	36.8	399
	S.Ed	1.3	0.06	0.21	0.02	9.89
	C.D (P=0.05)	2.6	0.12	0.42	0.05	22.82

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive.

The details of the invention, its object and advantages explained hereinbefore is to be understood that the invention, as fully described herein is not intended to be limited by the objects mentioned herein.

I CLAIM:

1. A composition for fertigation comprising:

heterocyclic nitrogen;

phosphonic sequester (P_2O_5); and

dipotassium oxide (K_2O),

wherein the composition may either be in soluble liquid or soluble powder form.

2. The composition as claimed in claim 1, wherein the heterocyclic nitrogen is derived from pyrimidine series or hexamine, the said pyrimidine series include pyrimidine or pyrazine or diaminopyrimidine.

3. The composition as claimed in claim 1, wherein the phosphonic sequester (P_2O_5) nutrition and chelation is derived from sequestering agent selected from one amongst Amino Trimethylene Phosphonic Acid (ATMP), its disodium salt or its potassium salt.

4. The composition as claimed in claim 1, wherein pH of the composition is between 5 and 6.

5. The composition as claimed in anyone of claims 1 to 4, in soluble liquid form comprising:

Pyrimidine series	: 32 kg;
[or]	
Hexamine	: 28.8 kg
ATMP	: 20 kg;
KOH or KCL	: 10 kg; and
H_2O	: 38 kg,

wherein the KOH (Potassium hydroxide) or KCl (Potassium Chloride) provides potash, and

wherein final composition in soluble liquid form comprising 10.6% heterocyclic nitrogen, 7% P_2O_5 and 6 to 9 % K_2O.

6. A process for preparation of composition in soluble liquid form as claimed in claim 5 comprising:

i. Mixing 32 kg of liquid pyrimidine series or 28.8 kg of liquid hexamine with 20 kg of ATMP to form pyrimidine series ATMP complex or hexamine ATMP complex;

ii. Subjecting to mild heating of pyrimidine series ATMP complex or hexamine ATMP complex at temperature ranges between 25 degree C and 30 degree C;

iii. Adding 10 kg KOH or KCl to the resultant composition for neutralization; and

iii. Adding 38 kg of water to the resulting composition obtained to yield final composition in soluble liquid form.

7. The composition as claimed in anyone of claims 1 to 4, in soluble powder form comprising:

Pyrimidine series	: 60 kg;
[or]	
Hexamine	: 54 kg;
ATMP Na_2	:20 kg;
H_2O	: 38 kg;
KOH or KCL	: 10 kg; and
Dispersal	: 10 kg,

wherein the KOH or KCl provides potash, and

wherein final composition in soluble powder form comprising 21% heterocyclic nitrogen, 11 % P_2O_5 and 6 to 9% K_2O.

8. A process for preparation of composition in soluble powder form as claimed in claim 7 comprising:

i. Mixing 60 kg of pyrimidine series or 54 kg of hexamine in powder form with 20 kg of ATMP Na_2;

ii. Dissolving the resultant composition obtained in 38 kg of water, boiled and secured slurry;

iii. Adding 10 kg KOH or KCl to the slurry;

iii. Machine drying the resultant composition; and

iv. Adding 10 kg alkyl aryl sulphonate dispersal to the dried composition which is further blended mechanically to yield final composition in powder form.

9. The composition as claimed in anyone of claims 1 to 4, in liquid form comprising:

Pyrimidine series	: 60 kg;
[or]	
Hexamine	: 54 kg;
ATMP K	: 20 kg; and
H_2O	: 20 kg,

wherein final composition in liquid form comprising 21% heterocyclic nitrogen, 5.2% P_2O_5 and 6.8% K_2O.

10. A process for preparation of composition in liquid form as claimed in claim 9 comprising:

i. Mixing 60 kg pyrimidine series or 54 kg of hexamine with 20 kg ATMP K ($C_3H_6K_6NO_9P_3$) and subjecting to mild heating upto 25 degree C; and

ii. Dissolving the resultant composition obtained in 20 kg of water to yield final composition in liquid form.

INTERNATIONAL SEARCH REPORT

International application No.

PCT / IN 2014/000135

A. CLASSIFICATION OF SUBJECT MATTER

IPC: ***C05C11/00*** (2006.01); ***C05G1/00*** (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

C05

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EPODOC, Depatisnet

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3547613 A (RAYMOND ANTHONY SMITH, JOHN THOMAS DIXON) 15 December 1970 (15.12.1970) Column 1, line 59 - column 2, line 50; example 1, claims 1,2,9.	1 - 10
A	EP 1795516 A1 (SOLUTIA EUROPE N.V./S.A, KEMIRA GROWHOW N.V. /S.A) 13 June 2007 (13.06.2007) [0003], [0009], [0011], [0012], [0016], claims 1, 3 - 5.	1-10
A	RO 120799 B1 (SOCTECH S.A.), 30.08.2006 [abstract]. Retrieved from DEPATIS database. Retrieved on 2014-07-07. "Abstract"	1 - 10

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 July 2014 (10.07.2014)	14 July 2014 (14.07.2014)
Name and mailing address of the ISA/AT Austrian Patent Office Dresdner Straße 87, A-1200 Vienna Facsimile No. +43 / 1 / 534 24-535	Authorized officer BAUMSCHABL F. Telephone No. +43 / 1 / 534 24-459

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT / IN 2014/000135

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