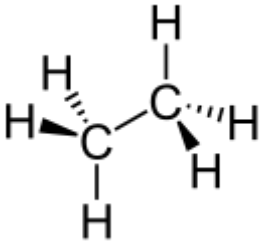
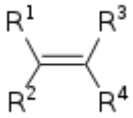
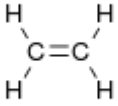
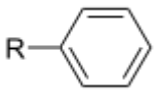
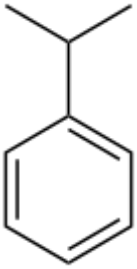
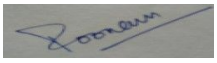
Chemical class	Group	Formula	Structural Formula	Prefix	Suffix	Example
Alkane	Alkyl	$R(CH_2)_nH$		alkyl-	-ane	 Ethane
Alkene	Alkenyl	$R_2C{=}CR_2$		alkenyl-	-ene	 Ethylene *(Ethene)*
Alkyne	Alkynyl	$RC{\equiv}CR'$		alkynyl-	-yne	Acetylene *(Ethyne)*
Benzene derivative	Phenyl	RC_6H_5 RPh		phenyl-	-benzene	 Cumene *(Isopropylbenzene)*

Fig. 1a



Poonam Singla
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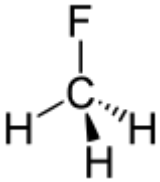
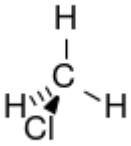
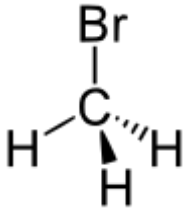
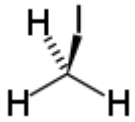
Chemical class	Group	Formula	Structural Formula	Prefix	Suffix	Example
haloalkane	halo	RX		halo-	alkyl **halide**	 Chloroethane *(Ethyl chloride)*
fluoroalkane	fluoro	RF		fluoro-	alkyl **fluoride**	 Fluoromethane *(Methyl fluoride)*
chloroalkane	chloro	RCl		chloro-	alkyl **chloride**	 Chloromethane *(Methyl chloride)*
bromoalkane	bromo	RBr		bromo-	alkyl **bromide**	 Bromomethane *(Methyl bromide)*
iodoalkane	iodo	RI		iodo-	alkyl **iodide**	 Iodomethane *(Methyl iodide)*

Fig. 1b

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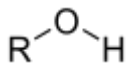
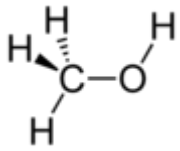
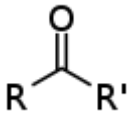
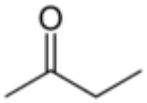
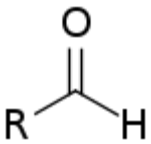
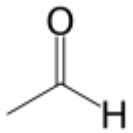
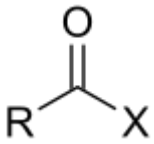
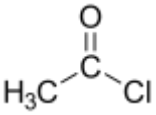
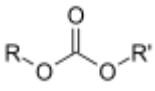
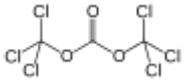
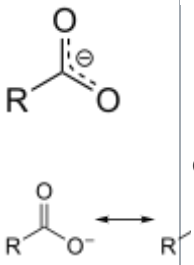
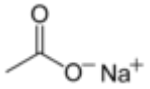
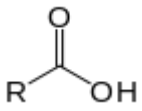
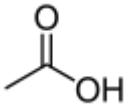
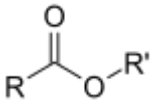
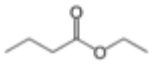
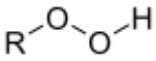
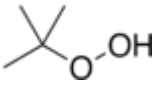
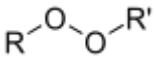
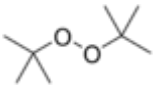
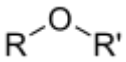
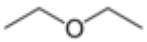
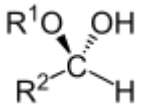
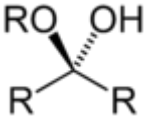
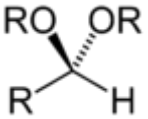
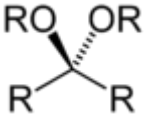
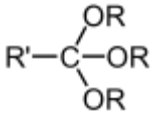
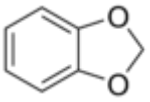
Chemical class	Group	Formula	Structural Formula	Prefix	Suffix	Example
Alcohol	Hydroxyl	ROH		hydroxy-	**-ol**	 Methanol
Ketone	Carbonyl	RCOR'		-oyl- (-COR') or oxo- (=O)	**-one**	 Butanone *(Methyl ethyl ketone)*
Aldehyde	Aldehyde	RCHO		formyl- (-COH) or oxo- (=O)	**-al**	 Acetaldehyde *(Ethanal)*
Acyl halide	Haloformyl	RCOX		carbonofluoridoyl- carbonochloridoyl- carbonobromidoyl- carbonoiodidoyl-	-oyl **fluoride** -oyl **chloride** -oyl **bromide** -oyl **iodide**	 Acetyl chloride *(Ethanoyl chloride)*
Carbonate	Carbonate ester	ROCOOR'		(alkoxycarbonyl)oxy-	alkyl **carbonate**	 Triphosgene *(bis(trichloromethyl) carbonate)*
Carboxylate	Carboxylate	$RCOO^-$		carboxy-	-oate	 Sodium acetate *(Sodium ethanoate)*

Carboxylic acid	Carboxyl	RCOOH		carboxy-	-oic **acid**	 Acetic acid *(Ethanoic acid)*
Ester	Carboalkoxy	RCOOR'		alkanoyloxy- or alkoxycarbonyl	alkyl alkan**oate**	 Ethyl butyrate *(Ethyl butanoate)*
Hydroperoxide	Hydroperoxy	ROOH		hydroperoxy-	alkyl **hydroperoxide**	 *tert*-Butyl hydroperoxide
Peroxide	Peroxy	ROOR'		peroxy-	alkyl **peroxide**	 Di-tert-butyl peroxide
Ether	Ether	ROR'		alkoxy-	alkyl **ether**	 Diethyl ether *(Ethoxyethane)*
Hemiacetal	Hemiacetal	$R_2CH(OR_1)(OH)$		alkoxy -ol	-al alkyl **hemiacetal**	
Hemiketal	Hemiketal	RC(OR″)(OH)R'		alkoxy -ol	-one alkyl **hemiketal**	
Acetal	Acetal	RCH(OR')(OR'')		dialkoxy-	-al dialkyl **acetal**	
Ketal (or Acetal)	Ketal (or Acetal)	RC(OR")(OR‴)R'		dialkoxy-	-one dialkyl **ketal**	
Orthoester	Orthoester	RC(OR')(OR'')(OR‴)		trialkoxy-		
Heterocycle (if cyclic)	Methylenedioxy	$(–OCH_2O–)$		methylenedioxy-	-dioxole	 1,2-Methylenedioxybenzene *(1,3-Benzodioxole)*

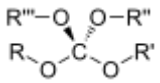
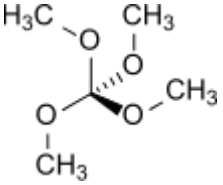
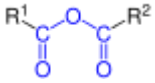
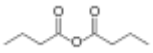
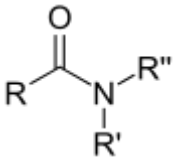
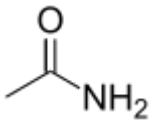
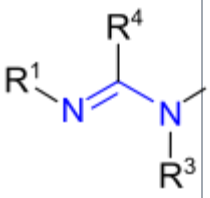
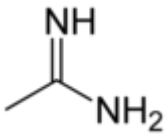
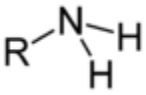
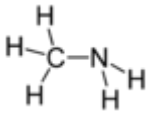
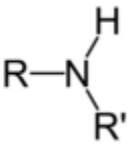
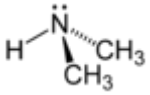
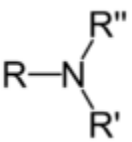
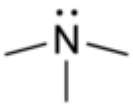
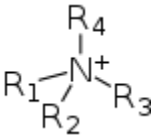
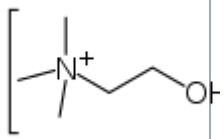
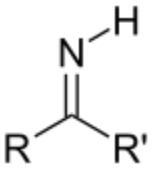
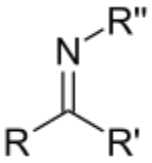
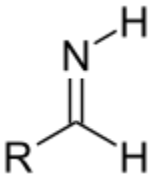
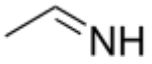
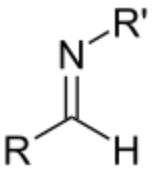
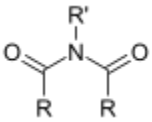
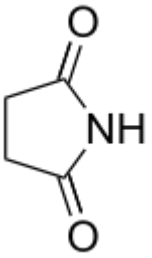
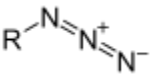
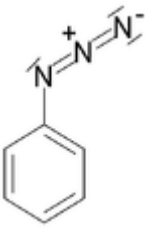
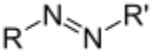
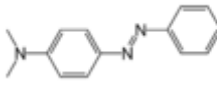
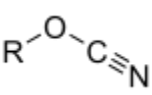
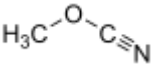
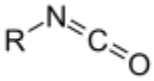
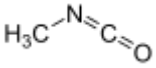
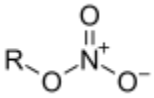
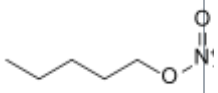
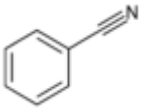
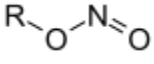
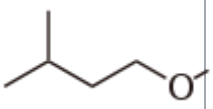
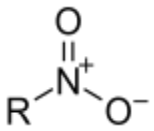
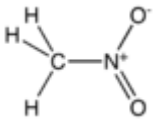
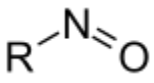
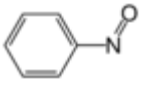
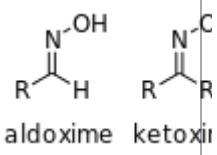
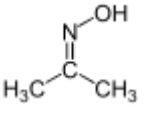
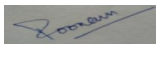
Orthocarbonate ester	Orthocarbonate ester	C(OR)(OR')(OR")(OR‴)		tetralkoxy-	*tetraalkyl* **orthocarbonate**	 Tetramethoxymethane
Organic acid anhydride	Carboxylic anhydride	$R_1(CO)O(CO)R_2$			anhydride	 Butyric anhydride

Fig. 1c

Chemical class	**Group**	**Formula**	**Structural Formula**	**Prefix**	**Suffix**	**Example**
Amide	Carboxamide	RCONR'R"		carboxamido- or carbamoyl-	-amide	 Acetamide *(Ethanamide)*
Amidine	Amidine	$RC(NR)NR_2$		amidino-	-amidine	 acetamidine (acetimidamide)
Amines	Primary amine	RNH_2		amino-	-amine	 Methylamine *(Methanamine)*
	Secondary amine	R'R"NH		amino-	-amine	 Dimethylamine
	Tertiary amine	R_3N		amino-	-amine	 Trimethylamine
	4° ammonium ion	R_4N^+		ammonio-	-ammonium	 Choline

Imine	Primary ketimine	RC(=NH)R'		imino-	-imine	
	Secondary ketimine			imino-	-imine	
	Primary aldimine	RC(=NH)H		imino-	-imine	 Ethanimine
	Secondary aldimine	RC(=NR')H		imino-	-imine	
Imide	Imide	$(RCO)_2NR'$		imido-	-imide	 Succinimide (Pyrrolidine-2,5-dione)
Azide	Azide	RN_3		azido-	alkyl **azide**	 Phenyl azide (Azidobenzene)
Azo compound	Azo (Diimide)	RN_2R'		azo-	-diazene	 Methyl orange (p-dimethylamino-azobenzenesulfonic acid)
Cyanates	Cyanate	ROCN		cyanato-	alkyl **cyanate**	 Methyl cyanate

	Isocyanate	RNCO		isocyanato-	alkyl **isocyanate**	 Methyl isocyanate
Nitrate	Nitrate	$RONO_2$		nitrooxy-, nitroxy-	alkyl **nitrate**	 Amyl nitrate *(1-nitrooxypentane)*
Nitrile	Nitrile	RCN		cyano-	alkane**nitrile** alkyl **cyanide**	 Benzonitrile *(Phenyl cyanide)*
	Isonitrile	RNC		isocyano-	alkane**isonitrile** alkyl **isocyanide**	Methyl isocyanide
Nitrite	Nitrosooxy	RONO		nitrosooxy-	alkyl **nitrite**	 Isoamyl nitrite *(3-methyl-1-nitrosooxybutane)*
Nitro compound	Nitro	RNO_2		nitro-		 Nitromethane
Nitroso compound	Nitroso	RNO		nitroso- (Nitrosyl-)		 Nitrosobenzene
Oxime	Oxime	RCH=NOH	 aldoxime ketoxi		Oxime	 Acetone oxime *(2-Propanone oxime)*



Poonam Singla
IN/PA-3310
Agent of the applicant

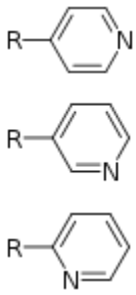
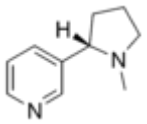
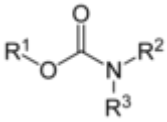
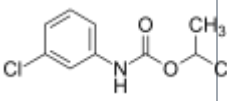
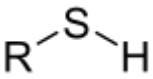
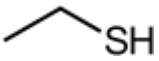
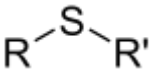
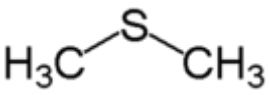
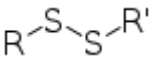
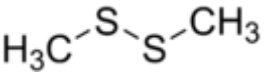
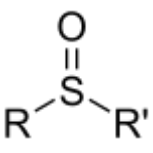
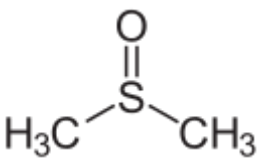
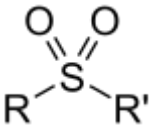
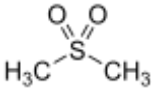
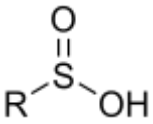
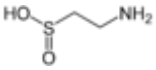
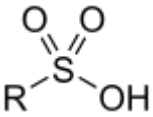
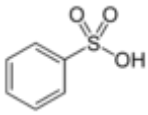
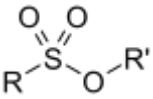
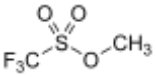
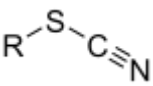
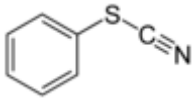
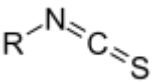
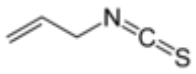
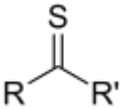
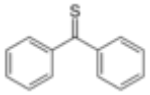
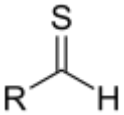
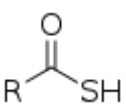
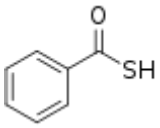
Pyridine derivative	Pyridyl	RC_5H_4N		4-pyridyl (pyridin-4-yl) 3-pyridyl (pyridin-3-yl) 2-pyridyl (pyridin-2-yl)	-pyridine	 Nicotine
Carbamate ester	Carbamate	$RO(C{=}O)NR_2$		(-carbamoyl) oxy-	-carbamate	 Chlorpropham *(Isopropyl (3-chlorophenyl)carbamate)*

Fig. 1d

Chemical class	**Group**	**Formula**	**Structural Formula**	**Prefix**	**Suffix**	**Example**
Thiol	Sulfhydryl	RSH		sulfanyl- (-SH)	**-thiol**	 Ethanethiol
Sulfide (Thioether)	Sulfide	RSR'		*substituent* sulfanyl- (-SR')	di(*substituent*) **sulfide**	 (Methylsulfanyl)methane (prefix) or Dimethyl sulfide (suffix)
Disulfide	Disulfide	RSSR'		*substituent* disulfanyl- (-SSR')	di(*substituent*) **disulfide**	 (Methyldisulfanyl)methane (prefix) or Dimethyl disulfide (suffix)
Sulfoxide	Sulfinyl	RSOR'		-sulfinyl- (-SOR')	di(*substituent*) **sulfoxide**	 (Methanesulfinyl)methane (prefix) or Dimethyl sulfoxide (suffix)

Sulfone	Sulfonyl	RSO_2R'		-sulfonyl- (-SO_2R')	di(*substituent*) **sulfone**	 (Methanesulfonyl)methane (prefix) or Dimethyl sulfone (suffix)
Sulfinic acid	Sulfino	RSO_2H		sulfino- (-SO_2H)	**-sulfinic acid**	 2-Aminoethanesulfinic acid
Sulfonic acid	Sulfo	RSO_3H		sulfo- (-SO_3H)	**-sulfonic acid**	 Benzenesulfonic acid
Sulfonate ester	Sulfo	RSO_3R'		(-sulfonyl)oxy- or alkoxysulfonyl-	*R′* *R*- **sulfonate**	 Methyl trifluoromethanesulfonate or Methoxysulfonyl trifluoromethane (prefix)
Thiocyanate	Thiocyanate	RSCN		thiocyanato- (-SCN)	*substituent* **thiocyanate**	 Phenyl thiocyanate
	Isothiocyanate	RNCS		isothiocyanato- (-NCS)	*substituent* **isothiocyanate**	 Allyl isothiocyanate
Thioketone	Carbonothioyl	RCSR'		-thioyl- (-CSR') or sulfanylidene- (=S)	**-thione**	 Diphenylmethanethione (Thiobenzophenone)
Thial	Carbonothioyl	RCSH		methanethioyl- (-CSH) or sulfanylidene- (=S)	**-thial**	
Thiocarboxylic acid	Carbothioic *S*-acid	RC=OSH		mercaptocarbonyl-	**-thioic *S*-acid**	 Thiobenzoic acid *(benzothioic* S*-acid)*

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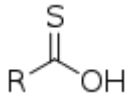
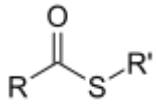
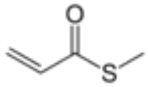
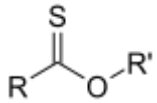
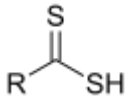
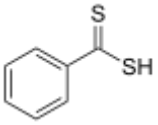
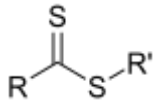
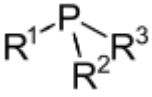
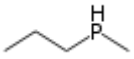
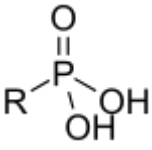
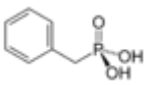
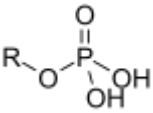
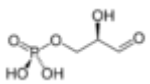
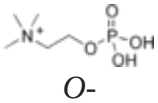
	Carbothioic *O*-acid	RC=SOH		hydroxy(thiocarbonyl)-	**-thioic *O*-acid**	
Thioester	Thiolester	RC=OSR'			*S*-alkyl-alkane-**thioate**	 S-methyl thioacrylate *(S-methyl prop-2-enethioate)*
	Thionoester	RC=SOR'			*O*-alkyl-alkane-**thioate**	
Dithiocarboxylic acid	Carbodithioic acid	RCS_2H		dithiocarboxy-	**-dithioic acid**	 Dithiobenzoic acid *(Benzenecarbodithioic acid)*
Dithiocarboxylic acid ester	Carbodithio	RC=SSR'			**-dithioate**	

Fig. 1e

Chemical class	Group	Formula	Structural Formula	Prefix	Suffix	Example
Phosphine (Phosphane)	Phosphino	R_3P		phosphanyl-	-phosphane	 Methylpropylphosphane
Phosphonic acid	Phosphono			phosphono-	*substituent* **phosphonic acid**	 Benzylphosphonic acid
Phosphate	Phosphate			phosphonooxy- or *O*-phosphono- (phospho-)	*substituent* **phosphate**	 Glyceraldehyde 3-phosphate (suffix)
						 *O*-Phosphonocholine (p

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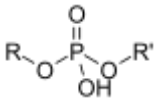
						refix) (Phosphocholine)
Phosphodiester	Phosphate	$HOPO(OR)_2$		[(alkoxy)hydroxyphosphoryl]oxy- or *O*-[(alkoxy)hydroxyphosphoryl]-	di(*substituent*) hydrogen **phosphate** or phosphoric acid di(*substituent*) **ester**	DNA *O*-[(2-Guanidinoethoxy)hydroxyphosphoryl]-L-serine (prefix) (Lombricine)

Fig.1f

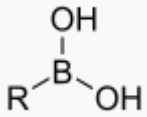
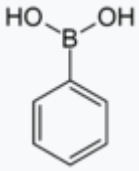
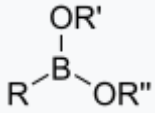
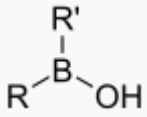
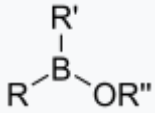
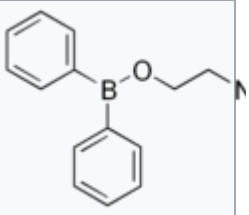
Chemical class	**Group**	**Formula**	**Structural Formula**	**Prefix**	**Suffix**	**Example**
Boronic acid	Borono	$RB(OH)_2$		Borono-	*substituent* **boronic acid**	 Phenylboronic acid
Boronic ester	Boronate	$RB(OR)_2$		O-[bis(alkoxy)alkylboronyl]-	*substituent* **boronic acid** di(*substituent*) **ester**	
Borinic acid	Borino	R_2BOH		Hydroxyborino-	di(*substituent*) **borinic acid**	
Borinic ester	Borinate	R_2BOR		O-[alkoxydialkylboronyl]-	di(*substituent*) **borinic acid** *substituent* **ester**	 Diphenylborinic acid 2-aminoethyl ester (2-Aminoethoxydiphenyl borate)

Fig. 1g

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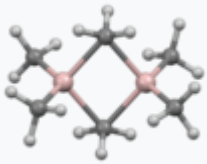
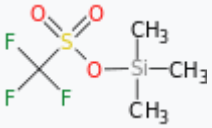
Chemical Class	Structural Formula	Prefix	Suffix	Example
Alkyllithium	RLi	(tri/di)alkyl-	-lithium	$H_3C—Li$ methyllithium
Alkylmagnesium halide	RMgX (X=Cl, Br, I)[note 1]		-magnesium halide	$H_3C—MgCl$ methylmagnesium chloride
Alkylaluminium	Al_2R_6		-aluminium	 trimethylaluminium
Silyl ether	R_3SiOR		-silyl ether	 trimethylsilyl triflate

Fig. 1h





Fig. 2a

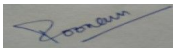


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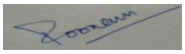
Fig. 2b



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FORM 2

THE PATENTS ACT, 1970(39 of 1970)
&
THE PATENTS RULES, 2003

COMPLETE SPECIFICATION
(See section 10, rule 13)

***1. Title of the invention*: Nano fertilizer for agriculture applications**

2. Applicant(s)

NAME	NATIONALITY	ADDRESS
SIRIGIRI CORPORATE PRIVATE LIMITED	Indian	No 1564 Shivashakti Building, near vegetable market, ILKAL, Bagalkot, Karnataka, India

3. Preamble to the description

COMPLETE SPECIFICATION

The following specification particularly describes the invention and the manner in which it is to be performed.

NANO FERTILIZER FOR AGRICULTURE APPLICATIONS

FIELD OF THE INVENTION

[1] The invention relates generally to the field of agriculture. In particular, the invention relates to a novel composition more than twenty micronutrients at nano level to prepare a nano fertilizer.

BACKGROUND OF THE INVENTION

[2] Agriculture has evolved in parallel with human evolution. Conventional agriculture demands the regular use of fertilizers, along with traditional agricultural practices, which can tremendously boost the crop growth, the yield, the productivity, and the nutritional value. Hence, chemical fertilizers have played an indispensable role in the growth of modern agricultural practices since the era of the green revolution.

[3] These advancements helped in increasing crop production phenomenally, they exert several harmful effects like diminishing the nutritional quality of soils, decreasing the resistance to pathogens and pests, and exert adverse effects on the environment. This includes the need for the development of new and innovative fertilizers that have a very high efficiency and minimal disadvantages.

[4] Therefore, nano fertilizers are one of the most promising solutions or substitutes for conventional fertilizers. These engineered materials are composed of nanoparticles

containing macro- and micronutrients that are delivered to the plant rhizosphere in a regulated manner.

[5] Nano fertilizers are nutrients that are encapsulated or coated within nanomaterial in order to enable controlled release, and its subsequent slow diffusion into the soil leads to soil fertility, crop production and with minimum or no environmental tradeoffs. Nano fertilizers are one of the most promising engineered materials that are being tested, either for soil or foliar applications.

[6] Traditionally, Nano fertilizer disclose fertilizer with large concentration of nitrogen and phosphorus, which is toxic for environment as well as animals and human being. The proposed nano fertilizer is the world's first nano fertilizer in India with 20+ micronutrients at nano level for foliar and soil application. The proposed nano-fertilizer have less concentration of primary nutrients. The fertilizer also having good zeta potential, viscosity and PH value. Another advantage of proposed fertilizer is utilize different groups for the purpose of synthesis. The proposed fertilizer is non-toxic, safe, non-hazardous and skin insensitive to all species.

OBJECTIVE OF THE INVENTION

[7] Objective of the present invention is to provide a novel composition of nano fertilizer for agriculture applications. The fertilizer in liquid form is known as nano foliar fertilizer as the application is on the leaf surface. The fertilizer in the solid form is like talcum powder. The powder form fertilizer is applied for soil application. The micro

nutrients to constitute nano fertilizer lies at nano level or particle size in between 1-100nm.

SUMMARY OF THE INVENTION

[8] An embodiment of the instant invention is a novel composition of nano fertilizer comprising more than one primary and secondary nutrients. The weight percentage of primary nutrients are 50-55% and rest are secondary nutrients.

[9] A further embodiment of the nano fertilizer composition, wherein the primary nutrients includes micronutrients such as nitrogen, Phosphorus and Potassium, wherein the secondary nutrients includes micronutrients such as zinc, boron, ferrous, magnesium, manganese and the like.

[10] Another embodiment of the nano fertilizer composition, wherein the weight percentage of primary nutrients are disclosed. The weight percentage of nitrogen is 26%, the weight percentage of phosphorus is 26%, and the weight percentage of potassium is 26%.

[11] Another embodiment of the nano fertilizer composition, wherein the weight percentage of secondary nutrients are disclosed. The weight percentage of the weight percentage of boron is 2 wt%, sodium 1 wt%, magnesium 16 wt%, alumina 1 wt%, silicon 25 wt%, zinc 0.4%, sulphur 10 wt%, fluorine 1 wt%, graphene 0.1 wt%, molybdenum 1 wt%,

calcium 0.21 wt%, titanium 0.2wt%, ferrous 0.2 wt%, copper 3 wt%, manganese 1 wt% and argenum 0.1 wt%.

[12] Another embodiment of the nano fertilizer composition, wherein the micro nutrients to constitute nano fertilizer lies at nano level or particle size in between 1-100nm.

[13] Another embodiment of the nano fertilizer composition, wherein the fertilizer exist in liquid and powder form, wherein the wt% includes weight / litre of water in case of liquid nano fertilizer and weight / kg in case of solid powder form nano fertilizer.

[14] Another embodiment of the nano fertilizer composition, wherein the prepared solution is diluted in water at a proportion of 2ml/litre for foliar fertilizer and the dilution of soil application is 25kg / acre of land.

[15] Another embodiment of the nano fertilizer composition, wherein the nano fertilizer at liquid or solid level is dosed by some other Diamond like Carbon elements (DLC). The addition of the DLC may vary from 1-100% by weight.

[16] Another embodiment of the nano fertilizer composition, wherein the nano micronutrients may be encapsulated with polymers like Poly Vinyl Pyridine (PVP), epoxy, or other elements mentioned in periodic table for their faster rate of absorption or to inculcate slow release formula for the plants.

[17] Another embodiment of the nano fertilizer composition, wherein synthesis of nano fertilizer is based on one or more groups such as hydrocarbon groups, halogen groups, nitrogen groups, sulpur groups, phosphorus groups, boron groups, metals groups etc.

BRIEF DISCRIPTION OF DRAWINGS

[18] The novel features and characteristics of the disclosure are set forth in the description. The disclosure itself, however, as well as a preferred mode of use, further objectives, and advantages thereof, will best be understood by reference to the following description of an illustrative embodiment when read in conjunction with the accompanying drawings. One or more embodiments are now described, by way of example only, with reference to the accompanying drawings wherein like reference numerals represent like elements and in which:

[19] Figure 1 (a-h) shows synthesis of nano fertilizer is based on groups such as hydrocarbon groups, halogen groups, nitrogen groups, sulpur groups, phosphorus groups, boron groups, metals groups etc.

[20] Figure 2 shows the comparison of conventional fertilizers and proposed nano fertilizer composition.

DESCRIPTION

[21] For promoting an understanding of the principles of the invention, reference will now be made to the embodiment illustrated in the figures and specific language will be used to describe them. It will nevertheless be understood that no limitation of the scope of the invention is thereby intended. Such alterations and further modifications in the illustrated

system, and such further applications of the principles of the invention as would normally occurs to those skilled in the art are to be construed as being within the scope of the present invention.

[22] It will be understood by those skilled in the art that the foregoing general description and the following detailed description are exemplary and explanatory of the invention and are not intended to be restrictive thereof.

[23] The terms "comprises", "comprising", or any other variations thereof, are intended to cover a non-exclusive inclusion, such that a process or method that comprises a list of steps does not include only those steps but may include other steps not expressly listed or inherent to such a process or method. Similarly, one or more sub-systems or elements or structures or components preceded by "comprises... a" does not, without more constraints, preclude the existence of other, sub-systems, elements, structures, components, additional sub-systems, additional elements, additional structures, or additional components. Appearances of the phrase "in an embodiment", "in another embodiment" and similar language throughout this specification may, but not necessarily do, all refer to the same embodiment.

[24] Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by those skilled in the art to which this invention belongs. The system, methods, and examples provided herein are only illustrative and not intended to be limiting. Embodiments of the present invention will be described below in detail with reference to the accompanying figures.

[25] The proposed solution is a novel composition of nano fertilizer for agriculture applications. The fertilizer exist in liquid form as well as solid form. The fertilizer in liquid form is known as foliar fertilizer, is sprayed on to the leaf surface. The fertilizer in solid form is like talcum powder. This powder form fertilizer is applied for soil application.

[26] The proposed composition of nano fertilizer includes 20+ micronutrients (shown in Table 1) at nano level. The fertilizer consist of primary and secondary nutrients. The primary nutrients refers to the Nitrogen, phosphorus and potassium (N-P-K) elements. The secondary nutrients refers to all other elements like boron, sodium, magnesium, alumina, silicon, zinc, Sulphur, fluorine, carbon, molybdenum, calcium, titanium, ferrous, copper, manganese, oxygen and argentum etc.

[27] As per table 1, the weight percentage of primary nutrients i.e nitrogen is 16%, phosphorus is 16%, and potassium is 8%. Further, the weight percentage of secondary nutrients i.e boron is 0.5 wt%, sodium 3 wt%, magnesium 1 wt%, alumina 14 wt%, silicon 12 wt%, zinc 3 %, sulphur 3 wt%, fluorine 1 wt%, carbon 0.999 wt%, molybdenum 1 wt%, calcium 3 wt%, titanium 1 wt%, ferrous 2 wt%, copper 3 wt%, manganese 1 wt%, oxygen 10.5 wt% and argentum 0.001 wt%. Hence, the weight percentage of primary nutrients are 40 wt% and the weight percentage of secondary nutrients are 60 wt%. Also, the raw materials utilized for the micronutrients may be prepared from chemicals or by the usage of the natural available raw materials on the earth. Also, the dosage of the Nano fertilizer may be varied based on the nutritional or diseases condition of the plants.

[28] In an embodiment, foliar and soil application have all the constituents at nano level.

[29] In other embodiment, nano level of micro nutrients refers to the particle size in between 1-100nm.

Content	Percent (wt%)	Content	Percent (wt%)
Boron (B)	0.5	Zinc (Zn)	3
Oxygen (O)	10.5	Sulphur (S)	3
Sodium (Na)	3	Fluorine (F)	1
Magnesium (Mg)	1	Nitrogen (N)	16
Alumina (Al2O3)	14	Phosphorus (P)	16
Silicon (Si)	12	Carbon (C)	0.999
Potassium (K)	8	Molybdenum (Mo)	1
Calcium (Ca)	3	Copper (Cu)	3
Titanium (Ti)	1	Manganese (Mn)	1
Ferrous (Fe)	2	Argentum (Ag)	0.001

Table 1

[30] In case of liquid nano fertilizer, Wt% refers to the weight / litre of water and weight / kg in case of solid powder form. Further, the mentioned wt. % of the elements in the table may change from 0.1-100% depending on the crop specific requirement.

[31] In an embodiment, the prepared solution is diluted in water at a proportion of 2ml/litre for foliar fertilizer.

[32] In other embodiment, the dilution of soil application is 25kg / acre of land.

[33] In another embodiment, the usage of micronutrients at nano level may be in single form or all together based on the crop specific requirement.

[34] Additionally, table 2 shows the general specification for proposed nano fertilizer. The table shows comparison of the particle size of Liquid Nano Fertilizer sample and solid Nano Fertilizer sample. Whereas the properties such as zeta potential, viscosity and PH values of liquid and solid nano fertilizer occurs within specific range.

1.	The nitrogen concentration of the foliar fertilizer 1-16%	
2.	**Particle Size in nanometer(nm) in one dimension**	
	Physical particle size (as per TEM Analysis)	20-50
	Hydrodynamic particle size (as per DLS Analysis)	20-80
3.	**Zeta potential in mV (+/- scale)**	
	Liquid Nano Fertiliser sample (measured directly)	>30
	Solid nano-fertiliser sample (measured in 1:10 Fertiliser : H2O suspension)	
4.	**Viscosity in cps**	
	Liquid Nano Fertiliser sample (measured directly)	5-30
	Solid nano-fertiliser sample (measured in 1:10 Fertiliser : H2O suspension)	
5.	**pH**	
	Liquid Nano Fertiliser sample (measured directly)	4.5 – 6.0
	Solid nano-fertiliser sample (measured in 1:10 Fertiliser : H2O suspension)	

Table 2

[35] In Addition, the nano fertilizer at liquid or solid level may de dosed by some other Diamond like Carbon elements (DLC). DLC refer to nano level carbon elements such as Single Walled Carbon Nanotube (SWCNT), Double Walled Carbon Nanotube (DWCNT), Multi Walled Carbon Nanotube (MWCNT), Quantum Dots (QDs), Graphene, etc.

[36] In an embodiment, the addition of the DLC may vary from 1-100% by weight.

[37] Further, the nano micronutrients is encapsulated with polymers like Poly Vinyl Pyridine (PVP), epoxy, or other elements mentioned in periodic table for their faster rate of absorption or to inculcate slow release formula for the plants.

[38] Fig. 1 (a-h) shows the synthesis of nano fertiliser is based on groups such as hydrocarbon groups, halogen groups, nitrogen groups, sulpur groups, phosphorus groups, boron groups, metals groups etc.

[39] The methodology adopted for the synthesis of nano fertilizer may be Top-down or Bottom up approach. Top down refers to arriving at the nano size from macro or micro level. And Bottom up refers to the synthesis of material at molecular or atomic size level.

[40] The nano micronutrients may be functionalized nano particles which consist of mentioned groups:

1.1 Hydrocarbons

1.2 Groups containing halogen

1.3 Groups containing oxygen

1.4 Groups containing nitrogen

1.5 Groups containing sulfur

1.6 Groups containing phosphorus

1.7 Groups containing boron

1.8 Groups containing metals

[41] The hydrocarbons group (Fig 1a) consist of Alkyl, Alkenyl, Alkynyl, Phenyl, but not limited to these groups. Halogen Groups group (Fig 1b) consist of halo, fluoro, chloro, bromo, iodo, but not limited to these groups. Groups Containing Oxygen (Fig 1c) consist of groups such as hydroxyl, carbonyl, aldehyde, and the like. Groups containing nitrogen (Fig 1d) consist of groups such as carboxamide, Amidine, Amines, Imines and the like. Groups containing sulfur (Fig 1e) consist of groups such as sulfhydryl, sulphide, disulhide and the like. Groups containing phosphorus (Fig 1f) consist of groups such as Phosphino, phosphono, phosphate and the like. Groups containing boron (Fig 1g) consist of groups such as Borono, boronate, borino and the like. Groups containing metals (Fig 1h) consist of groups di alkyl and tri alkyl.

[42] These groups can be in combination or as single entity utilized for the synthesis of nano fertilizer meant for agriculture applications.

[43] Fig. 2 shows the comparison of conventional fertilizers and proposed nano fertilizer composition. The proposed fertilizer increases the production of crops. The diagram shows LC50 as cutoff Acute lethal concentration of proposed nano fertilizer as non-toxic, safe, non-hazardous and skin insensitive.

EXPERIMENTATION ON ANIMALS:

[44] Chicken - Based on the “Acute Oral Toxicity Study of Sufala in Chicken, Gallus gallus domesticus”, the LD50 was found to be more than 2000mg/Kg body weight. Hence, the test item, Sufala was considered to be non-toxic for Chicken.

[45] Guinea pigs - Based on the results obtained from present study, it is concluded that the proposed fertiliser did not produce any skin sensitization reaction to guinea pigs, when prepared as per the label claim of the sample.

[46] RATs- The proposed fertiliser composition is non-toxic at the tested dose level of 2000 mg/kg b.wt in Wistar albino rats when applied by oral route and LD50 is greater than 2000 mg/kg b.wt. According to Globally Harmonized Classification (GHC) it comes under Category-V.

[47] Based on the acute contact toxicity study, LD50 of Sufala for Honeybee, Apis mellifera was found to be more than 100µg/bee. As no mortality was observed up to 48 hours, the test item was found to be safe for Honey bee. Hence, further study is not required.

[48] Fish - Based on the results obtained from "Acute toxicity study of Sufala in Guppy fish, Poecilia reticulate", the LC50 was found to be more than 100.0 mg/L. Hence, the test item is considered to be non-toxic for fish.

[49] Based on the results obtained from present study, it is concluded that the test compound is non-hazardous to Earthworm, Eisenia fetida at concentration of 1000 mg/Kg of artificial soil.

[50] AIT - Based on the results obtained from present study, it is concluded that the test compound is non-toxic to wistar albino rats at dose 3.1 mg/L acc. to regulatory Guidelines

of “OECD- 403” for Testing of Chemicals. The cut-off Acute lethal Concentration (LC50) is found to be MORE THAN 3.1 mg/L under the test condition.

[51] AEI - Based on above findings, it can be concluded that the test compound, when prepared as per instructions by the sponsor and label claim i.e. 3 ml per liter of water was found to be non-irritating (N) when applied to the conjunctival sac of the New Zealand White rabbits at the dose level of 0.1 ml within observation period. No clinical signs of toxicity were also observed during the entire observation period. The eye irritation index was calculated for eye irritation scoring index is 0.00.

[52] ADI - Based on the results obtained from present investigation, it can be concluded that the test compound when applied to shaven back skin of rabbits in the dose level of 3mL/L did not show any sign of toxicity after 24 hrs of test compound application in female rabbits after 24 hrs of application under the test condition (OECD 404).

I/We Claim:

1. A Nano fertilizer composition comprising:
   more than one Primary and secondary nutrients, wherein the weight percentage of primary nutrients are 40 wt% and weight percentage of secondary nutrients are 60 wt%.

2. The Nano fertilizer composition as claimed in claim 1, wherein the primary nutrients includes micronutrients such as nitrogen, Phosphorus and Potassium, wherein the secondary nutrients includes micronutrients such as zinc, boron, ferrous, magnesium, manganese and the like.

3. The Nano fertilizer composition as claimed in claim 2, wherein the weight percentage of nitrogen is 16%, the weight percentage of phosphorus is 16%, and the weight percentage of potassium is 8%.

4. The Nano fertilizer composition as claimed in claim 2, wherein the weight percentage of boron is 0.5 wt%, sodium 3 wt%, magnesium 1 wt%, alumina 14 wt%, silicon 12 wt%, zinc 3 %, sulphur 3 wt%, fluorine 1 wt%, carbon 0.999 wt%, molybdenum 1 wt%, calcium 3 wt%, titanium 1 wt%, ferrous 2 wt%, copper 3 wt%, manganese 1 wt%, oxygen 10.5 wt% and argentum 0.001 wt%.

5. The Nano fertilizer composition as claimed in claim 1, wherein the size of particles size is at nano level i.e 1-100nm.

6. The Nano fertilizer composition as claimed in claim 1, wherein the fertilizer exist in liquid and powder form, wherein the wt% includes weight / litre of water in case of liquid nano fertilizer and weight / kg in case of solid powder form nano fertilizer.

7. The Nano fertilizer composition as claimed in claim 6, wherein the liquid nano fertilizer is diluted in water at a proportion of 2ml/litre and the powder nano fertilizer is diluted at a proportion of 25kg / acre of land.

8. The Nano fertilizer composition as claimed in claim 1, wherein the nano fertilizer is dosed with nano level carbon elements having weight percentage 1-100wt%.

9. The Nano fertilizer composition as claimed in claim 1, wherein the micronutrients are encapsulated with polymers such as Poly Vinyl Pyridine (PVP), epoxy, or other elements having faster rate of absorption or to inculcate slow release formula for the plants.

10. The Nano fertilizer composition as claimed in claim 1, wherein synthesis of nano fertiliser is based on one or more groups such as hydrocarbon groups, halogen groups, nitrogen groups, sulpur groups, phosphorus groups, boron groups, metals groups etc.

Dated this on 25th October 2022



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TITLE - NANO FERTILIZER FOR AGRICULTURE APPLICATIONS

ABSTRACT

The present invention discloses the usage of nano fertilizer for agriculture applications. The foliar and soil application will have all the constituents at nano level. Nano level refers to the particle size in between 1-100nm. The fertilizer consists of primary and secondary nutrients. The primary nutrients refer to the N-P-K elements. The secondary nutrients refer to all other elements like Zinc, Boron, Ferrous, Magnesium, manganese, etc. The nano fertilizer at liquid or solid level may de dosed by some other Diamond like Carbon elements (DLC). The nano micronutrients may be encapsulated with polymers for their faster rate of absorption or to inculcate slow- release formula for the plants.

Fig. 1